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► **To cite this version:**

Michel Bonifay, Paul Reynolds. ‘Late Antiquity’ and Ceramics reconsidered. Leonard Rutgers; Neil Christie; Robin Jensen; Jodi Magness. The Cambridge Encyclopedia of Late Antique Art and Archaeology, Cambridge University Press, In press. halshs-03914984

HAL Id: halshs-03914984

<https://shs.hal.science/halshs-03914984>

Submitted on 2 Mar 2023

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‘LATE ANTIQUITY’ AND CERAMICS RECONSIDERED

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DEFINING THE FIELD

Millions of pottery sherds are found every year in Late Antique layers of thousands of archaeological sites in the Mediterranean and beyond. What are they useful for? The answer is at least obvious to archaeologists who have been willing to collect and patiently study them: pottery is a major tool for approaching the chronology, economy and society of ancient times. Traditional approaches to this documentation (typological classification, graphic and photographic record, catalogues), together with modern ones (quantification, archaeometry, cartography), are able to inform us more and more precisely on these three points.

This assertion is valid for each historical period but the question here is: is there something specific or different about the ceramic repertoire and other associated features (production, distribution, economy, etc) between the mid-third and end of the seventh centuries in comparison to the preceding or subsequent periods?

THE EVIDENCE

Leaving aside storage vessels (*dolia* and *pithoi*), the small objects (figurines, moulds, masks, etc.), as well as ceramic building material, it is customary to divide Roman ceramics into four main categories: fine wares, ‘coarse’ wares (including cooking wares, *mortaria*, and non-slipped, often buff coloured ‘plain’ wares for the table, kitchen and other domestic uses), lamps and amphorae. Tracing how long forms in these categories are attested is a first way to characterize ‘Late Antique’ (as opposed to Medieval-) pottery.

Fine wares

Fine wares, slipped, generally open (bowls, dishes) and closed forms (jugs, flagons) for use at the table, in fine (or not so fine: ARS D) clays, often decorated with stamped designs or paint, sometimes imitating shapes and decoration of late Antique silver ware, are the main marker of Roman Antiquity in pottery assemblages. How did the regional wares of the Imperial period evolve during Late Antiquity? What was new, when and where? When did Late Antique fine wares disappear?

The leading role of African fine wares

When ‘Late Antiquity’ begins, Africa has become the main source of fine wares in the Western Mediterranean. From the end of the first century onwards, the Roman province of *Africa proconsularis* developed a new type of tableware, called *African Red Slip Ware* (henceforth named ARS) with a distinctive red-orange slip and a typology based both on the Italian/Gaulish and Neo-Punic repertoire of forms. During the second century and the beginning of the third century, these wares were massively exported throughout the Western Mediterranean, probably usually accompanying African grain cargoes supplied to the capital of the Empire, the ARS then being redistributed to the provinces as part of return cargoes. Far from being in decline, ARS production and distribution reached its peak during Late Antiquity.

The first ARS which can be called ‘Late Antique’, appears *c.* 320/330 AD in the Carthage region (ARS ‘D’), with the start of new workshops located in the lower Mejerda valley (El Mahrine and satellites),¹ characterised by new shapes (dishes Hayes 59, 61A and then 67) and stamped (geometric) decoration (fig. 1.2-3). In central *Byzacena* (the very important workshop at Sidi Marzouk Tounsi)², ARS ‘C’ of the fourth century (bowls and dish Hayes 52-54) is distinguished by new appliqué

decoration (fig. 1.1) with both Pagan and Christian themes. Also typical of these latter workshops are the well-known mould-made rectangular dishes with magnificent relief decoration (e.g. Pegasus and Nymphs, personifications of African provinces, Abraham's sacrifice) of the late fourth century and beginning of the fifth century. The influence of metal ware shapes and decoration is obvious in both workshop areas. The preponderance of large dishes in the ARS repertoire may reflect a trend, from the 3rd century onwards, perhaps, towards the sharing of a central dish during communal meals (as depicted in representations of the Last Supper).³

In the late fourth century a new production began (category E), with workshops probably located in southern *Byzacena*, although they have not yet been discovered. The distribution of this category is mainly restricted to its regional African markets, but some examples are documented in the Adriatic and Greece. Lastly, various *African* regional productions were very active during the fourth century and the first half of the fifth century (workshops of Henchir es-Srira and Sidi Aïch; Tripolitanian Red Slip ware), also inland in eastern modern Algeria (Numidian Red Slip Ware).

ARS production did not end with the Vandal conquest and Byzantine reconquest. Particularly striking is the renewal from the mid-fifth century until the first half of the sixth century of central *Byzacena* (ARS C5) production with new shapes (dishes and bowl Hayes 82-85) and (geometric and Christian) decoration directly inspired from metal ware (fig. 1.4-5). The early to mid Vandal period also introduced a whole series of new forms that are attested in Carthage⁴ and in the northern gulf of Hammamet region where an important workshop becomes active at this time (Sidi Khalifa/*Pheradi Maius*).⁵ From the end of the fifth century to the second half of the sixth century the Carthage region workshops (Oudhna and the so-called, unlocated 'Atelier X', identified only by geochemical analyses)⁶ produced small (bowls Hayes 95-99) and large (dishes Hayes 103-104) vessels with Christian stamped decoration (crosses, saints) (fig. 1.6), as well as some Pagan reminiscences (Bacchus). The latest products, from the end of the sixth century onwards (forms Hayes 105-109), were not stamped (fig. 1.7) or bear burnished (spiral or sometimes floral- and more rarely Christian-) patterns. The quality of the production (slip and fabric) decreased only in the mid-seventh century and some very poor variants seem to survive well into the first half of the eighth century. The use of saggars when firing the potteries in the kiln, in order to obtain the uniform red-orange slip of north African tablewares, was now abandoned.

The widespread distribution of ARS in the Mediterranean from the fourth century to the second half of the seventh century, though testimony of continuity in the Roman world during its progressive disintegration, is not free of repeated ruptures:⁷ After a drop in its distribution in the second half of the third century, African tableware regains, towards the mid fourth century, its former first place not only in the Western Mediterranean, but also this time in the East, generating a flow of local imitations. Following a second drop in the fifth century, when the East was virtually cut off from western exports and the West experienced a slow-down of these imports, the ARS distribution recovered during the first half of the sixth century in the West and the East. Lastly, from the end of the sixth century, ARS reached less and less numerous destinations, exceptions being some western Byzantine sites (Cartagena, Koper, Naples) and major ports or military sites in the East (Antioch, Butrint, Nikopolis-Actium, Tocra, Corinth, Beirut, Emporio-Chios) and, at the end of the seventh century, a few important port-cities (Rome, Constantinople, Marseilles).

The survival and end of Roman fine wares in the northern Mediterranean

A series of Late Antique derivatives of Italian, Gaulish and Spanish *terra sigillata* are known in the north-western Mediterranean and in the Northern provinces, which were all in transition during the second half of the third century. In Spain, when the *Terra Sigillata Hispánica* of *Baetica* disappeared at the end of the second century, the La Rioja valley workshops continued small scale production, giving rise, in the second half of the third century, to a new category of Spanish red slip ware *Terra Sigillata Hispánica Tardía* (TSHT) (fig. 1.8).⁸ In Gaul, while late, plain variants of East Gaulish *Terra Sigillata* were still produced and locally distributed in the first half of the fourth century, new wares appear in the late third century. Two are particularly important: the *sigillée d'Argonne*, characterised

by wheel-rouletted decoration in horizontal bands (including some late Christian motifs) lasted until the second half of the fifth century, its distribution being mainly restricted to northern Gaul, from Belgium to Brittany, and south-eastern Britain.⁹ The so-called *sigillée luisante* (Lamboglia's *t.s. lucente*) produced in Savoy, with a distinctive flambé slip, feather-rouletting and over-painted decoration, has more or less the same chronology and was mainly exported to southern Gaul as well as Liguria and some remote places in southern Spain and Tunisia (fig. 1.9).¹⁰ In Italy, after the second century, only red slip wares with a regional distribution are known (e.g. the so-called *sigillata medioadriatica*); during the fourth century, small workshops producing red slipped imitations of ARS (especially of the dish Hayes 61A) were spread across the whole peninsula. The latest fine wares of *Italia*, still inspired by African models (fig. 1.10), were produced in southern Italy during the sixth century.¹¹ All these wares testify to a certain drop in technology, especially in slipping and firing, and an impoverishment of the decoration, motifs in relief being replaced by gouged and painted patterns.

Another point characteristic of late Antiquity in the northern Mediterranean is the widespread production of reduction-fired (grey) fine wares from the beginning of the fifth century onwards. This particularity can be observed with various regional wares, from Braga (*Cerâmica Cizenta Tardia*) in the West to Thessaloniki (Macedonian '*T.S. grise*') in the East, the most famous being the Gaulish *Dérivées-des-Sigillées Paléochrétiennes* (DS.P).¹² These wares, influenced both by the Gaulish repertoire of forms and numerous African characteristics (especially the stamped decoration with geometric and Christian motifs), comprised three groups, with three different locations and chronologies: a Languedoc group, dated to between the late fourth century and the first half of the fifth century, a Provençal group (main workshops in the neighbourhood of Marseilles) (fig. 1.11), dated to the fifth to early sixth century (with later developments well into the seventh century), and an Aquitanian group (Bordeaux?) (fig. 1.12), with a main period of production in the sixth century and the first half of the seventh century. Late variants of these wares, especially in Provence, probably gave rise to at least some of the medieval grey pottery repertoire.

Some other changes can be observed in the western Iberian Peninsula, northern Gaul and Italy with a series of no longer entirely slipped, only partly painted wares. Decoration is sometimes well executed, for example in the Mosel and Eiffel region (*céramique marbrée et flammée*) in the fourth century or in the Italian Abruzzi region (*ceramica tipo Crecchio*) (fig. 3.2) in the sixth century. Painted pottery subsequently became a widespread phenomenon during the medieval period. Lastly, it is not clear whether western Late Roman lead-glazed wares are linked on the one hand to early Roman glazed wares, or on the other to those of the Mid-Byzantine period. Some examples are known in the Rhine Valley¹³ during the fourth century and in Carlino¹⁴, not far from Aquileia, from the fourth to the mid-sixth century (fig. 3.1), while central and southern Italian (Rome and Sicily) products seem to occur later, not before the second half of the seventh century.¹⁵

Eastern Mediterranean fine wares: a later renaissance

The late 3rd century brought the end of production of previously successful Eastern Sigillata A (at *Rhosus*?) (supplying Levantine cities) and Ephesian-region Eastern sigillata B (cf. major exports to the Adriatic and Cyrenaica) and a break or, more likely, a major drop in the production-exports of the other principal eastern table wares which appeared regularly from the later fourth and early fifth centuries, but with a far smaller range of forms by comparison with those of their Imperial *sigillata* predecessors. Of these, only two wares were exported inter-provincially and to the West, Cypriot Red Slip Ware (CRSW, also known as Late Roman D) and Phocian Red Slip Ware (PRS, also known as Late Roman C).¹⁶ Numerous workshops in middle Egypt, lasting well into the Umayyad period (Egyptian Red Slip Ware; also the producer of attractive painted wares), unlocated workshops in the Black Sea (Pontic Red Slip Ware; typical in the Crimea and on lower Danube urban and military sites, both regions being possible sources)¹⁷ and other regions (Jordan: Jerash Red Slip Ware; Thessaloniki: Macedonian *T.S. grise*) also produced table wares for their immediate markets. Only Egyptian RS was sometimes exported beyond Egypt: Egyptian 'A', produced in the kaolinitic clay of the Aswan region and with a formal repertoire largely inspired by African RS, reached as far as Marseille and Beirut in the seventh century (fig. 2.9), while fourth-century examples of Egyptian 'B', in the nilotic clay of

Middle Egypt is present in Beirut. Dishes and bowls of all these wares were decorated with stamps on their floors, in the fashion of ARS (or metal ware) of the times, with a similar tendency towards progressive simplification (LRC: single idiosyncratic animal, human and Christian motifs; Egyptian RS). The stamping of vessels ended during the mid to late sixth century in most cases (LRC, Pontic Red Slip Ware, Jerash bowls with painted decoration: fig. 2.10; CRSW: stamped decoration reappeared in the 640s).

CRSW (11 forms, all table wares except for a part-slipped basin: fig. 2.4) was produced at least until the end of the 7th century (cf. the 660s destruction material at the fort of Emporio (Chios) and late seventh century contexts in Constantinople). The evolutionary development of dish forms 2 and 9 from c. 450-700, provides useful chronological indicators, especially when the ware occurs with LRC (fig. 2.1-2). Since John Hayes' *Late Roman Pottery*, work in Cyprus, Alexandria and Beirut has identified intermediate, as well as previously unknown, fifth and sixth century forms of CRSW. Another development has been the identification of workshops producing CRSW forms on the south Anatolian coast (e.g. Perge, Pedlenissos; Anemurium?) which has given rise to the argument that CRSW was not actually produced in Cyprus (no workshops have ever been found there).¹⁸ Given the absence, so far, of classic CRSW basins (fig. 2.4) at Pedlenissos where both classic and non-CRSW forms were produced, some questions on the source(s) of CRSW still need to be resolved (probably by chemical analyses of CRSW from consumer sites, e.g. Beirut). Continuity into the eighth century has been, not unequivocally, proposed for the Anatolian versions of the ware.¹⁹

Late Roman C (10 forms), unlike Pergamene *sigillata*, produced exclusively at coastal locations (Phocaea, Gryneon and Çandarlı, the latter providing evidence of likely direct continuity in the case of the dish Çandarlı form 3/LRC 1), was the most successfully distributed eastern table ware. Its distribution is complex, particularly by comparison with Aegean products (amphorae and cooking wares) and its special links to exports of alum, as well as the procurement of British tin, and the *annona* supply of the East may all have played a role in its distribution.²⁰ With restricted eastern exports in the late fourth century (dish form 2: fig. 2.5, e.g. Athens, Corinth, Butrint), from the mid fifth to mid sixth century dish LRC 3(A-H) was the most commonly exported form in both East (Aegean, Greece, Black Sea and the northern, lesser southern, Levantine provinces) and West (but to specific ports, such as Ravenna, and, to a lesser extent, Marseilles, as well as Benalúa-Alicante, the Atlantic and Britain, perhaps redistributed from Vigo;²¹ LRC was notably very rare in Carthage and Naples) (fig. 2.6-7). With the exceptional case of Vigo (Galicia), late sixth-seventh century LRC 10A-C was rarely exported beyond the East (there is a marked concentration of finds in Constantinople, the Crimea, Chios and Tocra) (fig. 2.8).

The production of stamped grey tables (from Ephesus? Or Samos?) and likely production of a regional class of micaceous Pontic Red Slip Ware in the southern Black Sea point to alternative regional solutions in the sixth and seventh centuries. Finally, the development of glazed wares for the Constantinople market from the seventh century onwards (some exports occur in Cyprus, Umayyad Egypt and certain ports, often Byzantine enclaves in the West: Rome, Naples? (is there glazed there or not?), Carthago Nova, Tarragona) can be paralleled with the slightly later development of glazed wares in Byzantine Italy (see above).

Coarse wares

The West

There were no real changes during the fourth century. The noted proposed production model that closed (North Mediterranean-) (fig. 3.5-8) and open (South Mediterranean-) forms (fig. 3.4 and 10) reflect different sources of meat (cattle and pigs vs. sheep and goats) and cooking methods (boiling vs. braising)²², while being probably valid in general terms, needs careful investigation, given the complexity of cooking pot shapes (especially in the East). Perhaps one should contrast urban (pig dominated) contexts v. rural (sheep/goat and bovine) ones.

African coarse wares, probably directly succeeding those of the late Punic/Late Republican period, represent a common denominator in almost all the coastal pottery assemblages of the Western Mediterranean until the beginning of the fifth century (fig. 3.3-4). The success of African cooking wares was probably due to their exceptional resistance to thermal and mechanical shocks (high proportion of quartz temper in the fabric). In the middle of the third century, African coarse wares comprised several main regional products. The most important were the categories A (slipped) and CA (unslipped), probably produced in the same workshops in the Carthage region, with a distinctive range of dish (Hayes 181), casseroles (Hayes 23 and 197) and lids (Hayes 196). Categories B and CB were located in a large territory in mainly coastal parts of *Byzacena*, the first sharing with category A its slip, even thicker and glossier in this case, and the same form of dish (Hayes 181), while category CB provided completely different shapes of casseroles (Hayes 183). Lastly, almost everywhere in north Africa, including *Tripolitania*, regional workshops produced local versions of these main categories.²³ Things did not change during the second half of the third century, except for the creation of a new category (BT) in *Tripolitania*, linked with Tripolitanian RS, in the *Lepcis Magna* region.²⁴

Only at the end of the fourth century or the beginning of the fifth, do we see new, Late Antique features: the end of the major production and Mediterranean distribution of wheel-turned African cooking ware (only smaller-scale production survived in the Carthage region until at least the seventh century), the widespread production of closed, reduction-fired forms in the northern Mediterranean (fig. 3.5-8) (precursors of the Medieval mode of production), and the re-emergence of portable bread ovens ('*clibani*') in Italy (fig. 3.9), as well as in southern Greece, probably an indication of the production of bread in the household rather than in bakeries.²⁵

Another important feature of Late Antique coarse wares in the Western Mediterranean was the spread of different types of mortars, mainly, but not only, of African origin. Among the latter, it is worth mentioning the production of fifth to seventh-century small flanged bowls in the Carthage region (Carthage Class 1) and of fifth century mortars in Nabeul (type Fulford 22-23), found in most western Mediterranean assemblages. African basins were also widely distributed throughout the Late Antiquity. Finally, one can raise the question whether the numerous African coarse ware jugs recorded in fifth- to seventh century contexts were transported empty or as containers of specific foodstuffs.

The last characteristic feature of Late Antique coarse wares was the development of hand-made and slow-wheel-made wares. Several of these products were widely traded, particularly in the south-western Mediterranean (notably to Carthage, the Balearics and south-eastern Spain), though there is also a concentration of finds in north-western Italy (Ventimiglia, Cosa) and south-eastern Gaul (Toulon). Most were produced in the central Mediterranean islands: in Pantelleria and especially in Sardinia.²⁶ In southern Gaul, the protohistoric tradition of hand-made pottery never completely ceased, but it made a new start from the second half of the third century onwards in the Rhone valley, and continued until the seventh century in some regions of south-eastern Provence. In Tunisia, 'Calcutic ware' (fig. 3.11) (akin to the hand-made wares of the modern Berbers) tended to slowly replace the wheel-turned African cooking wares from the end of the fourth century onwards. In north-eastern Italy calcitic slow?-wheel-made forms of the sixth to seventh centuries are thought to be local ('ceramica di tipo Classe') (fig. 3.8). The southern Balkans (e.g. sites in northern Albanian highlands) almost certainly produced similar calcitic forms and the distribution of these has been (not incontrovertibly) attributed to the 'Slavic' invasions and settlements of the late sixth century onwards.

In Spain local hand-made wares are a particular feature of sites on the east coast and the Balearics from the late fourth to the seventh centuries, products of the regions of Barcelona, Valencia, Alicante and Murcia. These were used alongside local and imported wheel-made wares (as was the case in Carthage). In southern Spain, slow-wheel-made versions of the sixth and seventh century (Byzantine-Visigothic period) shapes continued and provide key dating evidence for early Islamic sites prior to the introduction of glazed wares in the later ninth and tenth centuries.

The East

None of the western hand-made or slow-wheel-made wares circulated in the East. Successful, exported eastern cooking wares were those with quartz-rich or kaolinitic fabrics (Levantine), or volcanic fabrics (northern Aegean products). Excellent thin-walled wheel-made globular cooking pots with ‘strap’ handles and a frying pan, in volcanic fabrics, seem to be Aegean in origin (Phocaea and environs?: fig. 4.1-3), from similar sources to those supplying Aegean cooking pots to western, especially Adriatic, sites in the second to mid third centuries. The late wares were generally exported from the later 5th to 7th centuries, again with a markedly western distribution (being very rare in the Levantine provinces and Egypt).

In Syria the Byzantine period saw similar continuity in the large-scale centralised production of thin-walled, well-fired ‘brittle ware’ cooking forms (fig. 4.7).²⁷ Apamea, Androna and as yet unlocated workshops near the eastern Euphrates supplied their respective regions with a particular range of forms. Syria, here, as in the case of its amphorae (see below), was self sufficient. These excellent cooking wares were not exported.

Excavated sequences in Beirut demonstrate how, by the early 3rd century, a new local and imported (north Palestinian) ‘sliced rim’ casserole form with close fitting lid came to dominate the cooking repertoire. Introduced in the second century, they are generally thought to be originally associated with Jewish ‘kosher’ practices (some were definitely sold with lid still attached) (fig. 4.8-9). However, by the fourth century, production extended across *Phoenicia*, *Palaestina I-II*, Jordan and Egypt (notably not in Syria, Cyprus and southern Anatolia), but not in exclusively Jewish areas (e.g. absent at Kefar Hananya), and they occur on all classes of sites, including monasteries.

One late fifth to seventh century north Palestinian kaolinitic ware was especially successful as an export (‘Workshop X’: from Tell Keisan?). It was regularly exported to specific western ports (e.g. Ravenna, Carthage), being especially common at Marseilles and Tarragona in the first half of the seventh century (fig. 4.10).²⁸ The late sixth- to seventh-century Dhiorios workshops in northern Cyprus, with one exception, produced a quite different range of forms, some mirroring the forms of Syria and southern Anatolia. Indeed, a cooking pot with concave rim produced in Dhiorios (and possibly other examples in seventh-century Kourion)²⁹ is modelled on a ‘Workshop X’ form, typical in Beirut late sixth to early seventh century deposits. Examples found in Beirut Umayyad contexts may be local rather than Cypriot. It has been argued that this particular form continued into the eighth century.³⁰

Apart from the sliced rim casseroles the typologies of Egyptian coarse wares of the Byzantine and early Islamic periods (especially at Fustat) have received due attention in recent years and there is a much better understanding of their development and chronology. Middle Egypt (Aswan) was a major producer of slipped painted vessels (closed and open table wares). Exports of a small two-handled jug in this ware to both Beirut (c. 410) and Ravenna (c. 500) are probably due to their contents, as well as unusually strong contacts with Egypt in the same periods (cf. unusually high imports of Egyptian LRA 7 in Beirut).

Unlike the West, *mortaria* were not a characteristic feature in the East from the Roman period onwards. The mortars produced at Ras al Basit from the early third to sixth centuries (exported to Beirut and other Levantine ports) are however an exception to the rule (fig. 4.11). The specialised Byzantine period production and trade of large, hand-made (washing) basins, as well as *dolia* in the region of Amrit-Tartus (*Phoenicia*) is also worth noting, again well distributed along the Levantine coast and inland (Homs region). The widespread use of chamber pots (public and private contexts) from the mid third century onwards is well documented (fig. 4.12).

A range of micaceous cooking pots and spouted jugs that are typical finds in seventh century Constantinople, though not generally exported to sites in the East, reached Corinth,³¹ probably en route for Carthage, Naples, Marseilles and Tarragona where they provide evidence for likely direct links with the eastern capital (fig. 4.4).

Finally, small ‘*unguentaria*’ are a notable feature of Late Antiquity, associated with martyrial cults at specific centres (e.g. St John, at Ephesus, St. Nicholas, at Myra): water became holy as it passed through the saint’s tomb and was bottled for the eager pilgrims to take back home (fig. 4.5). These, in their regional fabrics, are found across the Mediterranean, Lycian examples reaching Benalúa-Alicante and Vigo (Galicia), along with the other eastern imports (including Limyran cooking pots) (fig. 4.6).³² The small disc-shape flasks bearing a portrait of St. Menas served a similar purpose for pilgrims to his monastery in the western Nile delta.

Lamps

In this area too, Africa played a leading role, especially from the moment when the first model of ‘Christian lamps’ (type Atlante VIII) (fig. 1.13) appeared in the late fourth century and even more when the second type (Atlante X) (fig. 1.14) began, in the second quarter of the fifth century, to invade Mediterranean consumption sites. These ARS lamps, produced in the same workshops as the tablewares, were the first Roman lamps to attain a Mediterranean-wide distribution, which lasted until the end of the seventh century. They were also imitated everywhere from Spain to Greece, including Germany, southern Gaul and Italy. These lamps are famous for their decorative motifs, with Pagan gods being replaced by crosses and biblical themes, although animals (perhaps not always having a religious significance) were the preferred representation. These lamps seem to survive the fall of Byzantine Africa, late non-slipped variants being produced well into the eighth century. Sicily also was an important production centre of lamps in the seventh century, lasting well into the eighth.

Other lamp productions of note were those in Athens, Corinth and Delphi (mainly African lamp imitations) (fig. 2.12), the Black sea (lamps with decorative handles, including crosses) (fig. 2.13), Ephesus (Broneer type XXIX with a foot-print on the underside) (fig. 2.14), Cyprus and/or Antioch (‘pebble’ lamps of Wessberg type 20) (fig. 2.15), Levant (‘slipper’ lamps) (fig. 2.16) and in Egypt (fig. 2.17), all mainly active during the fifth to seventh centuries. Many of these also bear Christian motifs, adapting shapes of Roman times as well as being fore-runners of typical Mid-Byzantine or Islamic forms. Most of these eastern Mediterranean products with true Late Antique characteristics have only a primarily regional distribution.

Lastly, wheel-made lamps also were produced on the southern shores of the Mediterranean, with two main types: saucer-shaped lamps attested from the mid-third century in the Syro-Palestinian area and then from the sixth century in Africa, and small, wheel-made carinated lamps with a long nozzle (Bailey Q3339) (fig. 2.18), exported from Lycia? and reaching Sicily (Syracuse) and south-eastern Spain from the sixth century onwards. These and late Cretan wheel-made lamps possibly based on them would seem to be transitional forerunners of Islamic types. However, we should not focus too much on ceramics when dealing with lighting. Late Antiquity experienced major changes in lighting methods (glass lamps, candles, etc.), more typical of the Middle Ages.

Amphorae

Amphorae, emblematic vessels of Antique trade, were devoted to the commercialisation of the three main liquid or semi-liquid foodstuffs of the Roman Mediterranean: wine, oil and fish conserves and sauces. How did these transport amphorae evolve during Late Antiquity?

North Africa

Amphora production in *Africa* was continuous from the beginning of the Punic period and, after having slowed down during the early years of the Roman conquest, a new typology of containers began in the Flavian period and was well established by the mid-second century AD. In the second half of the third century, three different ‘families’ of African amphorae were still being contemporaneously produced: a) Amphorae of Punic tradition with handles attached on the body (e.g. type Tripolitana II); b) Amphorae of Graeco-Roman shape, with handles attached on the neck (types

Africana I = *piccola*, about 40lts, Africana II = *grande*, about 60lts, and Tripolitana III); c) African imitations of non-African shapes (e.g. Gaulish type 4 = Dressel 30 in Africa).

The problem of the content of African amphorae has not been completely solved. There is no doubt that the imitations of Gaulish amphorae were devoted to the transport of wine; the Africana I and Tripolitana III types probably carried olive oil, while the Africana II may have transported fish products and alternatively wine, but it is more difficult to determine the content of amphorae of Punic tradition.

At the very end of the third century or the beginning of the fourth century, the typology of the African amphorae changed with the birth of a Late Antique new series of slim-shaped containers (the Keay 25 or Africana III type, of about 26/27lts) (fig. 5.1). These amphorae, the best distributed of all the Roman African amphorae, were produced throughout the fourth century and until the beginning of the fifth. Recent chemical analyses³³ tend to confirm that the majority of these amphorae were devoted to the transport of wine, which represents a major change in the main foodstuffs exported from Roman Africa and points to the fact that the emphasis on oil exports seen in previous literature has perhaps been exaggerated.

At the end of the fourth century and mainly at the beginning of the fifth century, new types of African amphorae emerged, manifest in a double phenomenon of miniaturisation and gigantism of shapes: both small-size '*spatheia*' (fig. 5.2) (some of them with a capacity of no more than 3.5lts), characteristic of fifth-century contexts and large-size amphorae (with capacities between 50 and 120lts) which comprise a great number of different types (e.g. Keay 35: fig. 5.3). The transformation of the amphora typology of *Africa*, initiated prior to the Vandal conquest, reached its conclusion at the end of the fifth century when new, late Vandal types of large-size amphorae appeared (e.g. Keay 62) (fig. 5.4). Production continued without interruption during the Byzantine period, with the addition of new forms, always of large capacity (reaching an average of 90lts) at the end of the sixth century (Keay 61) (fig. 5.5) and in the middle of the seventh century (Keay 8A). At the same time, a new phase of reduction of amphora size occurred from the end of the sixth century onwards, with very small containers usually called '*miniature spatheia*' (half a litre) (fig. 5.6). A third group of seventh-century African amphorae comprised globular containers, influenced by eastern Byzantine forms (LRA 13?), some of which were exported (e.g. to Rome) (fig. 5.7). This general shape survived until the Aghlabid period.

An important trend is evidence for the complete reorganisation of amphora production in *Africa* in the first half of the fifth century. Kilns recognized on the ground, mainly along the eastern coastline of Tunisia (some of them also identified in the stamps, e.g. *COL(onia) HADR(umetum)*, Sousse in the Sahel region of Tunisia), show a specific mode of production: from the end of the first century onwards, amphora workshops were located in the suburbia of the port cities, implying that the foodstuffs needing to be exported overseas were first transported from the estates to the port, where they were put into amphorae. This pattern has been evidenced in Carthage through the deciphering of *ostraca* dating to the end of the fourth century³⁴ but there is no doubt that the system was already well in place in the second and third centuries, and not only in Carthage. At the very beginning of the fifth century, the suburban production areas of the port cities started to be abandoned. In some regions (e.g. in Nabeul), the workshops moved and were concentrated close to likely agricultural or industrial areas. In other places (e.g. the Sahel region) most of the workshops drastically slowed down or even completely ceased production and did not resume their activity before the beginning of the sixth, having relocated inland. During the seventh century, some of the latest workshops moved again, this time to the inner city areas (e.g. in Nabeul and *Leptiminus*).

Spain, Gaul and Italy

In Spain, by the late third century there was an overall decline in the role of *Baetica* as supplier of oil for the *annona* and a major reduction in the number of fish production sites. The bulky Dr 20 for oil was replaced by the diminutive Dr 23 (fig. 5.8) and the Imperial wide-necked fish amphorae by

narrow-necked cylindrical forms for fish sauce or smaller fish, such as sardines (types Keay 16 and Keay 22 = Almagro 50) (fig. 5.9), the latter form being also produced in *Lusitania* (Keay 16). The new African-style Keay 19/Almagro 51a-b (fig. 5.10) (e.g. Algeciras and Málaga), alongside the piriform Keay 23/Almagro 51c (fig. 5.11), however, mark the regeneration of the Baetican and Lusitanian fish industries from the mid to late fourth centuries, carrying products to places as distant as Corinth and Beirut. Whereas the Lusitanian fish factories rapidly declined by the early fifth century, mid-fifth century Tarragona (with its own Keay 91 type), Arles and Rome, for example, document the continued importance of oil exports in Dr 23. Though Baetican forms were produced up to the 550s (Sevilla contexts), exports were negligible (e.g. Benalúa-Alicante), certainly by comparison with contemporary imports of Tunisian and Eastern amphorae. Balearic (Ibiza?) wine in the tiny flagon-like Keay 79 (fig. 5.12) and in a new large cylindrical form (Cartagena contexts) was supplied to sites on the east coast of Spain following the Byzantine reconquest of the islands. The likely use of barrels and of small painted flagons for the transport of local wines should be noted in the villa-rich territories of north-western Spain, equally well served by their locally produced table wares (cf. the villa of Valdetorres de Jarama).³⁵

Established in the Augustan period, Gallic amphora production became standardised at the end of the first century AD with the dominance of the Gauloise 4 (fig. 5.13), which was massively produced, mainly in southern Gaul, until the mid-third century. During the second half of the third century, even though most workshops seem to have ceased activity, Gallic wine amphora production did not cease before the mid-fourth century. Nevertheless it is likely that these containers were slowly replaced by barrels (frequently depicted on reliefs; some actually survive in deposits), this major phenomenon in the packaging of Gallic wine probably starting earlier in the Northern provinces.

The same ‘barrel’ argument has been put forward for explaining the stagnation of the typology and production of Italian amphorae during the third century (or at least after the mid third century, given the major finds of Forlimpopoli type amphorae in the southern Adriatic). Nevertheless, two main zones seem to have continued dynamic production during the fourth century: Tuscany (the *vinum Tuscum* is recorded in the *Expositio Totus Mundi*), with the so-called Empoli amphorae (fig. 5.14), which had quite a wide distribution during the fourth century in the Western Mediterranean, and Sicily, where, during the third and fourth centuries, almost all the Sicilian cities seem to have produced their own wine and amphorae in similar, though slightly different shapes. Those with the widest distribution originated in Catania (‘Benghazi MR 1’) (fig. 5.15), Naxos (‘Palatine East type 1’) and along the north-west coast (the Ostia I, 455 type). These amphorae probably gave rise in the late fourth century to a new type (Keay 52) (fig. 5.16), massively produced first in north-eastern Sicily and then mainly in Calabria during the fifth century and the first half of the sixth century (in the sixth century, *Bruttium* wine is still praised by Cassiodorus)³⁶. Sicily (with the seventh-century type ‘Crypta Balbi 2’: fig. 5.17) and southern Italy (with its production of Byzantine-shaped globular amphorae in Campania and in Otranto) were the last regions of Italy producing commercial amphorae in the seventh century and beyond.

The East

The well known, widely traded Byzantine amphorae of the East (Late Roman Amphora 1-7) were defined from the sequences excavated at Carthage in the late 70s. (fig. 6.3, 18, 14, 8 and 11, respectively). This classification not only failed to take into account the pre-Byzantine start of most of these forms, but also reflects the very selective range and late date of Byzantine period eastern amphorae exported to the West. It is important also to note that the distribution of amphora (as well as specific fine ware and cooking ware) exports in the East were not homogeneous, indicating preferential supply routes for specific products and, with exports to the West and returning cargoes, offer clues to the complex, sometimes enter-twined, State, Church and private circulation of goods.³⁷

Cilicia, Cyprus and the Levant

Excavated sequences in Beirut have provided key evidence for the introduction and development of amphora forms of the region. The mid third century marked a drop in long distance imports and a shift towards the more close regional supply of amphorae, a trend that was to increase over the fourth to seventh centuries. This said, the mid fourth to early fifth centuries saw a renewal of significant contacts with previous long distance sources (*Baetica*, *Africa*, Aegean, Asia Minor and the Black Sea).

From its introduction and popularity in the mid third century, the LRA 1 was a constantly developing type (fig. 6.1-3).³⁸ It was produced on coastal sites of eastern *Cilicia* and Cyprus but apparently not in *Syria* and, after a hiatus, it re-emerged in the late fourth century (cf. exports to the Black Sea), but was not a major feature until the early fifth when it came to dominate most Mediterranean assemblages (and continued to do so until the arrival of the Umayyads). It was the most widely traded of all the known types, found across the Mediterranean and beyond (the Black Sea, Atlantic and Britain). Complex dipintos comprise not only Christian symbols and exclamations but also indications of their weight prior to and after filling with wine, presumably brought in skins to the coastal kiln sites (recalling the similar labelling of Dr 20 amphorae). The name of the merchant responsible for transshipments is also sometimes inscribed.³⁹

Many other amphorae of the region were established in the Imperial period and continued, notably only up to c. 400: Ras al Basit globular amphorae, Amrit amphorae, west Cilician pinched handle amphorae and south Phoenician Reynolds AM 14. Gazan amphorae progressively changed shape from the short, fat, Zemer 54 of c. 200-400, to the longer, narrower LRA 4 introduced in the 5th century, production ending probably in the Umayyad period (fig. 6.7). The 'bag-shaped' LRA 5 with ring handles of south *Phoenicia* and *Palaestina* appeared in the first century and continued into the Abbasid period (fig. 6.8 and 12). In fact, there were few new, fourth-century introductions, for example the well-known south Phoenician Agora M 334 (fig. 6.5) and other north Palestinian forms (AM 148 and AM 339).⁴⁰

Agora M 334, AM 14, LRA 5 and Gazan LRA 4 amphorae are all associated with increased wine production in the Byzantine period which served first the regenerated Levantine cities (and presumably also Alexandria and Antioch) and, from the fifth century the Christian West eager for wine from the Holy Land. Indeed, the wine amphorae of north *Phoenicia* (Amrit, Beirut) were only rarely exported (nor did the Imperial amphora-borne exports of dried fruit continue). Perhaps textiles were the primary focus of exports from Diocletian onwards. From c. 425 onwards the range of amphora imports found in Levantine cities dropped significantly to LRA 1, LRA 4, LRA 5 and, in the northern Levant, Black Sea *argile claire* amphorae (see below).

In inland Syria, the Byzantine period (fifth century?) saw the widespread production and distribution, particularly to military sites, of new local amphorae, painted examples in east Syrian Euphrates valley clays (fig. 6.9), others, in west Syrian calcareous clays (from the villages of the limestone Massif to *Apamea* and *Emesa/Homs*).⁴¹ The latter certainly continued well into the Abbasid period. LRA 1 is not particularly common, and there are even fewer Palestinian forms. The only significant imports in the late sixth-seventh centuries, notable at Zeugma, were Sinopean *argile claire* amphorae. (fig. 6.26)

Egypt

During Late Antiquity Egypt produced three main groups of amphorae. The first group comprised late variants of alluvial-clay (Delta and Nile Valley) AE 3/Egloff 172 amphorae (fig. 6.10) which were in perfect continuity with Mid-Roman models and continued into the Umayyad period. The second group was a new type of Egyptian amphora (LRA 7 = AE 7) (fig. 6.11), mainly originating from Middle-Egypt and comprising many variants, the earliest dating to the late fourth century and the most recent ones lasting well into the Fatimid period. Lastly, several Egyptian types were imitations of other Eastern Mediterranean amphorae. From the end of the sixth century-beginning of the seventh century, there were imitations of LRA 1 (Saqqara and at Uyun Musa, in the Western Sinai), as well as the ubiquitous Byzantine globular shape LRA 13 (= AE 8-1/Egloff 167) (fig. 6.13), the latter being produced until the tenth century (Umayyad examples were exported to Beirut, and probably Malta and

Rome). The most abundant are imitations of LRA 5/6 (= AE 5/6) (fig. 6.12), in different fabrics (calcareous and alluvial) corresponding to different kiln sites (Abu Mina and Kôm Abu Billu) and in two different shapes (Dominique Pieri's globular LRA 5 Type 3 and his LRA 5 Type 4), produced without discontinuity from the early seventh century until at least the twelfth century (both types were exported to Umayyad Beirut). The role of the monasteries in wine production and exports to Beirut and the West is very likely. Even if wine seems to have been the main foodstuff exported in Egyptian amphorae, these containers could have transported, mainly within the Egyptian territory, a great variety of contents (salted fish and meat, oil, fruits, etc.).

Asia Minor, the Aegean and Greece

The amphora typology of the Aegean islands, Asia Minor and, to some extent, Greece, is complex, primarily because of the widespread production of a few significant types across the region. Most of these (LRA 2, LRA 3, Agora M 273, fig. 6.18, 14 and 15) and other regional forms (Knidian; Kapitän II amphorae (fig. 6.20, a very late example), which could be Aegean or from the Black Sea)⁴² have origins that can be traced through the pre-Byzantine centuries and all these forms continued into the fifth century.

In contrast to its one-handled Imperial predecessor, the classic LRA 3 of the Byzantine period has two handles (fig. 6.14). The 'classic' Ephesian examples were distributed first in the East and then across the Empire, from the Crimea to all the western Mediterranean provinces, but other fabrics and peculiarities of shape distinguish the rarely exported examples of Kos and Sardis, for example.⁴³

Another Asia Minor-Aegean 'family' comprised amphorae related to the micaceous Samian Agora M 273 type (slightly bulbous neck, and rather pear-shaped body ending in a solid cone toe) (fig. 6.15). These and buff examples (Rhodian?) appear in the Levant and the West (Aquileia) in the fourth century, but also seem to have Imperial precedents.⁴⁴ Similar forms were produced elsewhere in the fifth and sixth centuries, perhaps both on Ikaria (fig. 6.16) and in Phocaea. Most of these variants are typical finds in the Adriatic (Nikopolis, Butrint, Durres/Dyrrhachium and Ravenna) and, in smaller quantities, in southern Gaul but, significantly, they rarely reached Levantine cities or Egypt. The distribution pattern recalls that of LRC. The late sixth to seventh-century version of Agora M 273 ('Samos cistern' amphorae: fig. 6.17) has a similar distribution, with the Byzantine duchy of Naples perhaps being an important new target: note here the finds of seventh century Constantinople cooking pots.

The LRA 2 (British Bi) type, with its comb-decorated globular body and cupped rim, is distinctive (fig. 6.18). Originally a second century form, the classic Byzantine shape, if perhaps not its fabric, had already appeared by the mid or late third century and its latest, seventh century examples had a tall neck (LRA 13: fig. 6.19). The most common traded examples of the late fourth to sixth centuries were from the Argolid and, probably, Chios, but the form was also produced in the Corinthia, as well as Dilesi (Boeotia), Delion and Megara (Attica), all on the Greek mainland. The known workshops of seventh century LRA 13 (Cyprus, Cos, Paros, possibly Samos and Chios), those of Cos bearing stamps connected with the Imperial administration, reflect a shift in production to Cyprus and the Aegean Islands and could be linked to the parallel production of LRA 1 outside the Cilician-Cyprus home of LRA 1 (Cos, Cnidos, Rhodes, possibly Samos), which perhaps focused on the supply of Constantinople and military sites (cf. Emporio-Chios, Saraçhane-Constantinople, and the cargo of the c. 625 Yassi Ada I shipwreck), especially after the loss of the Levantine provinces.⁴⁵ The combination of LRA 1 and LRA 2 recalls the previous widespread finds of fifth and sixth century examples on sites of the Lower Danube which, it has been proposed, was connected with Justinian's reorganization of the supply of the Danube army and the creation of the *Quaestura Exercitus* in 536 (comprising *Moesia Inferior*, *Scythia Minor*, *Caria*, the *Cyclades* and *Cyprus*), which ended with the loss of the Danube provinces in the early seventh century.⁴⁶

Successors of the small Imperial Cretan wine amphorae have now been classified (at Gortina) into a more or less continuous production series spanning the mid third to seventh centuries and beyond. It

is still unclear if the important late fourth to fifth century form Vila-roma 8.198/Agora M 235 is Cretan or from the Greek mainland (Messene has been suggested) (fig. 6.21: finds in Athens, Argos, Corinth, Butrint, *Lepcis Magna*, Rome, Marseilles and Tarragona). Late Cretan types are frequently attested in the Crimea in seventh century contexts, evidence for the major role of the Cretan ports in maritime traffic connecting Africa, Constantinople and its most northern outpost (fig. 6.24: TRC 6).⁴⁷ Another important late Cretan class with a rather oval-globular body is common (in a variety of fabrics) in early to mid sixth-century Butrint and Athens (TRC 2: fig. 6.23). Late versions of this type, recently classified as ‘imitations’ of both LRA 2 and LRA 1, seem to date beyond the seventh century and recall similar products found in numerous confusing types in seventh to ninth century deposits at Saraçhane, Constantinople, as well as ‘post-LRA 1’ produced on the Aegean Islands of Lipsi and Carpathos.⁴⁸

Finally a whole range of new fourth and fifth century forms in buff fabrics have recently been identified in Nicopolis-Actium. With the small free-standing fifth century forms produced at Delphi, a one-handed ‘Lakonian’ type (Agora M 315/336: common in Athens, Argos, Sparta and Butrint) and local Byzantine Corinthian forms, the complex thriving economies of *Epirus* and the Peloponnese, as well as possibly Corfu, are gradually emerging.

Black Sea

For decades now Russian, Bulgarian, Rumanian, Turkish and Polish scholars have been reconstructing the Hellenistic to Medieval typologies of amphora production (and imports) associated with the former Greek colonies of the Black Sea and of the Danube and Crimean frontiers (civilian and military contexts).⁴⁹ John Hayes’ typology for Saraçhane added a new dimension to the complexity and continuity of seventh to tenth century amphorae supplied to the capital. The work is, however, hampered by the paucity of quantified assemblages and too summary an attention to fabrics, and thus, origins.

An important exception is the identification of fourth to seventh century amphora production at Sinope (red fabric fourth to fifth century ‘carrot’ amphorae and mid fifth century shift to small ‘argile claire’ amphorae possibly based on LRA 1) (fig. 6.25-26). Shipwrecks off Sinope and the western Crimea containing LRA 1 and Sinopean amphorae trace the link between the region, Seleucia, the port of Antioch, the military supply network of Syria, and other ports of the north Levantine coast (Beirut, Caesarea).

Finds at *Nikopolis-ad-Istrum* and Dichin provide evidence for the later fifth century local imitation of LRA 2 and the supply of small, cylindrical, probably Crimean, containers (not dissimilar to LRA 1: Opaït B) (fig. 6.27). The latter are thought to have gradually replaced the much larger Zeest 80 type (produced in a variety of fabrics during the third to fifth centuries). Late Colchean amphorae with their characteristic sinuous bodies were also regionally traded (e.g. to Chersonesos) and, interestingly, reach Beirut in the period c. 450-550. These, three other ‘East Pontic’ (Colchean?) types, some LRA 5s and a late Bosphoran type accompany a batch of late Cretan amphorae, as well as LRC and Pontic Red Slip Ware, in a key late sixth century context, recently published from Pantikapeion (Kerch).⁵⁰

CURRENT TRENDS

Nowadays, major trends of research aim to both document more accurately the complex regional typologies of ceramics and to re-contextualize these ceramics and their supposed ‘Late Antique’ features within the history and economy of the Mediterranean world and beyond. Several major current, and future, trends can be distinguished.

First of all, Late Antique pottery is an ever more reliable dating tool. A better understanding of the chronology of Late Antique pottery comes from a more accurate account being taken of Late Antique levels within the excavations. The obvious lack of focus on this documentation in the 70s and even 80s

is now being progressively rectified in the field. Late Antique contexts and ceramic assemblages published the last 30 years are perhaps even more numerous than the Early- and Mid-Roman ones. Ceramic specialists now try to progress within the typologies and chronologies through collective works, aiming for a reassessment of previous classifications⁵¹ Nevertheless, this new approach uses new concepts. More emphasis is placed on the association of different ceramic classes in a context than on the supposed chronology of single artifacts, and classifications tend to become more 'linear' in order not to sever late Antique pottery from its Roman roots and later evolutions.⁵²

The search for and definition of the sources of wares and forms constitutes a second major trend of the current research. Ceramic specialists try to avoid the vague impasse of a generic attribution to too large geographical entities, such as 'Africa' or the 'Eastern Mediterranean'. This investigation increasingly benefits from archaeometric (both petrographical- and geochemical-) analyses, but nothing serious can be done without the identification of workshops on the ground. A notable trend has been the establishment of regional projects and funding in order to tackle regional typologies (e.g. *Per Terram per Mare*, for Cyprus; the *Pythagoras Project*, for Crete; the *Levantine Ceramics Project*; the *LRCWMED* project for the typology and archaeometry of western Mediterranean Late Roman coarse wares; and the *Ceramopôle* based in Aix-en-Provence which aims to provide an online encyclopedia of Mediterranean wares). Recent experience shows that major progress in this area can be achieved only through a rigorous, integrated archaeological and archaeometrical characterization of kiln sites.⁵³ This is the only way to reach a solid geographical attribution of the pottery found in consumption sites. The problem is that such surveys are facing irresistible phenomena of urbanization and agricultural mechanization in most of the southern Mediterranean countries, never mind problems linked to political instability, while it is possibly already too late for the northern Mediterranean where most of the evidence has already been destroyed. However, even if traces of pottery production are more directly threatened due to their upper stratigraphical position, the concern about pottery origin is not specific to Late Antique pottery.

Thirdly, quantitative approaches are more and more frequent and required, when studying production and consumption contexts. One might even say that these methods, consisting of counting every sherd, every rim-handle-base, sometimes transformed into Minimal Number of Individuals, or tempered by calculation of the extant section of rim (EVE), were invented and developed for Late Antique pottery. Even though these methods remain quite heterogeneous in the detail and not uniformly carried out by projects in both East and West, the data accumulated over the last 35 years already allow syntheses on a Mediterranean scale.⁵⁴ As far as amphorae are concerned, some scholars are calling for the quantification of not only the number of examples found in a site, but also the relative amounts of foodstuffs (in litres or cubic m) transported in these containers, which requires calculation of the capacities of each amphora form. Late Antique pottery studies may have a head start in the statistics field but this trend is common to all serious ancient pottery studies.

A fourth direction of the research is the question of the pottery contents. The problem is distinct when considering cooking wares and amphorae. In the first case, the question is more about alimentation, culture and culinary practices, while in the second case trade and economy are concerned, as the identification of what foodstuff was being carried is paramount. In both cases, great hope is placed in chemical analyses, protocols of which are more and more efficient and precise.⁵⁵ But the amphora question also faces other reflection criteria, such as vessel shape, *tituli picti*, region of production, presence or not of an internal pitch lining, etc. As in the case of determining the origin of each pottery form, the archaeometry of pottery residues and contents needs to be linked and confronted with archaeological and historical data in order to provide the most reasoned replies. Furthermore, the problem of the contents of Late Antique amphorae cannot be dissociated from the content of the predecessors and successors of each type in the perspective of linear typologies.

A fifth area where ceramic research is coming to the fore and where it can, with care, contribute to a fuller understanding of how the Mediterranean economy, particularly that of the East, functioned, is through the identification of how foodstuffs were packaged and redistributed, and by whom and for whom. The study of *tituli picti*, largely ignored, is finally providing key and surprising data in the case

of LRA 1, though similar information written on Aegean and other amphorae has yet to be properly assessed. The rich resource of papyrological evidence from Egypt has yet to be re-evaluated with respect to the ceramics and goods they often refer to. The possible role of the Church as producer, consumer and re-distributor of its own goods (e.g. in Egypt and Sicily) and hence, its possible role in the production and circulation of amphorae (and other ceramics) still needs to be explored:⁵⁶ is it a coincidence that the largest assemblages of seventh century ceramics are from ecclesiastical contexts in Rome and Constantinople? A definite ‘hot potato’, but one we must seize. The complex wealth of information from the late Roman law codes, difficult to understand at times, has led to considerably disparate interpretations of how goods were commandeered and redistributed. The extent to which the distribution of ceramics may have been influenced by general political conditions, such as, for example, the effects of the bipolarisation of the Empire from 330 AD onwards, the consequences of the Vandal conquest and the Byzantine reconquest of *Africa*, and the loss of Egypt and Levant in the first half of the seventh century, needs to be investigated. On the other hand, the question whether during Late Antiquity Imperial needs in grain, oil, wine, etc. were supplied in kind or if taxation was already completely monetised is still open. This question is particularly striking when considering the military supply of the East or the African grain supply to Rome before and after 455 (when the effect of the treaty of 442, still involving the Vandal kingdom in the *annona*, probably ceased). Lastly, apart from these Institutional Economics explanations, we should not forget free trade and the role of the demand for foodstuffs throughout the Mediterranean, the drop in which, perhaps linked to a demographic decrease, was perhaps responsible for the gradual fall of African imports in the first half of the fifth century, prior to the Vandal conquest.

A final sixth point, the study and full publication of shipwrecks is one field that has the potential to revolutionise our interpretation of supply networks and (with caution) maritime routes. In this reconstruction, geographical, physical and human factors all need to be considered: winds and currents, maritime connections attested by the written sources, variability of segmented navigations,⁵⁷ direct and indirect routes. Particular attention has been drawn to the phenomenon of return cargoes within centralized supply systems to Rome until the fifth century or to Constantinople from the fourth century onwards. To trace direct arrows on a map when speaking of pottery movements is no longer realistic. The modern use of robots, digital photographic recording and quantification of ship cargoes, as well as the recent trend towards deep sea surveys are yielding spectacular as well as surprising results and will continue to do so. Indeed, how can we understand the complexity of regional ceramic assemblages and distribution patterns if we do not understand what primary cargoes travelled with this pottery (or, equally, arrived without pottery) to those ports? The archaeological invisibility of textiles has already been referred to, but we do have important information to be gained on maritime (and terrestrial) routes from the quantification and study of other primary goods, such as stone and ceramic building material (an integral feature of the recovery, as well as reconstruction as Christian centres, of the cities of both the Byzantine East and the Roman West, e.g. Carthage). These processes in themselves need to be understood in order to explain the drop in the ceramic evidence documenting the transition from the third to fourth century.

All these trends in current (and future) research have the primary objective of trying to reconstruct the society and economies of Late Antiquity through one of the most abundant artifacts of material culture. However, if a chronological division must be drawn in the methods of research, this is not between Mid-Roman and Late Antique periods or between Late Antiquity and the early Middle Ages, because texts on everyday life and the economy are rare in all these periods, but with the recent Middle Ages and Modern times, when texts are abundant. So, the trends and goals of Late Antique pottery studies do not differ from those of Roman pottery studies. In both cases, one of the most striking questions is the Economy, because pottery is always the lowest common denominator in most of the excavations and land surveys which can be used to inform us about settlement chronology, the nature of the occupation, demographic evolution and trade connections. This last aspect has been the particular focus of scholars for thirty-five years, but the trend as a whole is now to introduce a maximum of complexity into the models.⁵⁸ The complexity created by the increased precision in chronology and pottery origins, as well as by quantification and information on contents has now been introduced into the general discussion taking into account not only consumer sites but also shipwrecks.

Research is also moving from the Mediterranean focus to include peripheral worlds, such as Atlantic connections or land transport (e.g. trans-Saharan trade).⁵⁹

The usefulness of pottery studies in the Economic History of Antiquity was questioned when this branch of archaeology was being developed in the 80s and 90s but is now largely accepted by archaeologists and historians alike. Nevertheless, there is no consensus on the interpretation of these data. Seeking to overcome the old quarrel between primitivists and modernists, the model proposed by D. Mattingly of a plural Roman economy juxtaposing a public sector ('imperial economy') and private sectors with inter-provincial or regional focuses ('extra-provincial' and 'provincial' economies), all of them being both interdependent and distinct, is probably the best fitted to give a clear picture of the complexity of mechanisms which generated pottery and amphorae movements. The notions of fiscal grain, 'commerce imbriqué',⁶⁰ return cargoes and intra-provincial connections can easily fit into this model. Nevertheless, in spite of its great conceptual efficiency, this model does not completely dispel the double opposition between two dual types of vision of the Roman economy: administered (main role devoted to the *annona*) vs. free-market economy and supply-driven vs. demand-driven economy. These surveys being based on a joint review of both the written sources and the archaeology, the ceramic data is often used to reinforce one model or the other. But neither ceramicists nor historians are experts outside their own fields. Archaeologists usually also understand the weaknesses of their own data. Historical and documentary evidence needs to be brought into the equation through interdisciplinary discussion and expertise.

This evidence and these questions are not specific to Late Antiquity. Perhaps the main observation is that there is no homogeneity in Late Antique pottery. We have seen how a general Mediterranean regeneration in the mid fourth century was coupled with the introduction of new forms in both East and West. The pre-'Byzantine', often third century origins of many ceramic traditions and their associated economies are equally evident. However, a major rupture occurred during the first half of the 5th century. What followed from the mid fifth century onwards, again viewed from the ceramic evidence, was in part a trend towards regional self sufficiency (sometimes with a military *facies*), coupled with long distance supply networks that connected the major ports of both halves of the Mediterranean. Equally significant is the growing evidence for ceramic continuity and exchange beyond the historical confines of the Arab conquests, ignoring political boundaries. In essence, this is what Peter Brown meant by 'Late Antiquity'.

IMPORTANT QUESTIONS FOR THE FUTURE

After having experienced some difficulties in recording in the preceding pages what makes this documentation specifically Late Antique, the legitimate question we must ask is: do we still need the concept of Late Antique pottery?

Even if changes are obvious in pottery and amphora production at the end of the third century and the beginning of the fourth century (end of workshops, new ones, morphologic changes, bipolarization of the distribution), the rupture is even more serious in the fifth century (drop in the demand, collapse of the Rome-centred distribution, new axes East-West leading to a complete reorganization of the production, mainly in the West). Continuity during the sixth and seventh centuries is patchy and is, perhaps, a little misleading. The weakening of the concept of Late Antique pottery echoes at the same time the questioning of the homogeneity of the Roman world in which local identities and 'résistance' are now more often recognised by what has become a new trend of the research.

In other words, pottery is hardly a mark of identity for a chronological division, Late Antiquity, created in reaction to the long-lasting disregard for the 'Bas-Empire' during the nineteenth and first half of the twentieth century, but too heterogeneous as far as this documentation is concerned. Even if the concept of Late Antiquity had, and probably still has, its utility in most areas (as demonstrated in this volume), it is perhaps dangerous and sterile (no brackets) to confine the ceramic evidence of the mid-third to the end of the seventh century into the framework of this historiographic construction. For

ceramic specialists it is now much more interesting to consider and evaluate this documentation in the 'longue durée', examining its links with Roman Antiquity and post-Roman/early Medieval or post-Byzantine/early Islamic developments, as is also the general trend in current Late Antique Archaeology. Indeed, now and in the future, research needs to focus on early medieval or early Islamic periods. Trying to shrink even more the concept of Dark Ages (understood as 'unknown to us') could be the paradigm shift in the pottery studies desired for the next (thirty?) years.

SELECT BIBLIOGRAPHY

The small space available for bibliography does not permit us to mention all the references useful for a comprehensive survey of Late Antique pottery. For a more detailed bibliographical orientation, see: Costa, S. (2013) 'The Late Antique Economy: Ceramics and Trade', in *Local Economies? Production and Exchange of Inland Regions in Late Antiquity*, ed. L. Lavan. Leiden and Boston: 91-130.

General discussions:

Some of the most interesting papers on Late Antique pottery ruptures and continuities have been written by Paul Arthur. We recommend reading his most recent contributions on this topic:

Arthur, P. (2007a) 'Form, Function and Technology in Pottery Production from Late Antiquity to the Early Middle Age', in *Technology in Transition AD 300-600*, eds. L. Lavan, E. Zanini, A. Sarantis. *Late Antique Archaeology* 4, Amsterdam: 159-186.

(2007b) 'Pots and boundaries. On cultural and economic areas between Late Antiquity and the early Middle Ages', in *LRCW2*: 15-27.

(2010) 'Riflessione intorno alla produzione e circolazione della ceramica nel basso Adriatico', in *LRCW3*: 79-88.

Worth mentioning are two old studies published by the late Prof. Paul-Albert Février, providing an illuminating and personal view on the place of Late Antique and early medieval pottery within the whole archaeological and historical documentation:

Février, P.-A. (1980) 'A propos de la céramique de Méditerranée occidentale (Ier-VIe siècle après J.-C.)', in *Céramiques hellénistiques et romaines*, eds. P. Levêque and J.-P. Morel. Besançon: 159-200.

(1992) 'Quelques observations sur la céramique des IVe-VIIe siècles', in *III Reunio d'Arqueologia Cristiana Hispànica* (Mao, 1988). Barcelona: 245-255.

The series of proceedings of *LRCW* congresses should be consulted because, since 2005, they have constituted the main source of documentation on Late Antique Coarse wares and Amphorae in the Mediterranean:

LRCW1 (2005), eds. J. M. Gurt i Esparraguera, J. Buxeda i Garrigós and M. A. Cau Ontiveros. *British Archaeological Reports* IS 1340, Oxford.

LRCW2 (2007), eds. M. Bonifay and J.-C. Tréglia. *British Archaeological Reports* IS 1662, Oxford.

LRCW3 (2010), eds. S. Menchelli, S. Santoro, M. Pasquinucci, M. and G. Guiducci. *British Archaeological Reports* IS 2185, Oxford.

LRCW4 (2014), eds. N. Poulou-Papadimitriou, E. Nodarou and V. Kilikoglou. *British Archaeological Reports* IS 2616, Oxford.

In the same way, a first volume has been published on Late Roman Fine Wares, resulting from a workshop held in 2008:

LRFW1 (2011) *Late Roman Fine Wares: solving problems of typology and chronology. New Approaches and New Contexts*, eds. M. A. Cau, P. Reynolds and M. Bonifay. *Roman and Late Antique Mediterranean Pottery* 1, Oxford.

Several other conferences have been held on Late Antique Pottery, these last 15 years. Some examples:

Caballero, L., Mateos, P. and Retuerce, M. (eds.) (2003) *Cerámicas tardorromanas y altomedievales en la Península Ibérica, Ruptura y continuidad* (Mérida, 2001). *Anejos del Archivo Español de Arqueología* XXVIII, Madrid.

Παπανικόλα-Μπακιρζή, Δ. and Κουσουλάκου, Ν. (eds.) (2010) *Κεραμική Τησ υστερησ αρχαιοτητασ απο τον ελλαδικο χωρο (3^{ος} -7^{ος} αι. μ.Χ.)*, Επιστημονική Συνάντηση (Θεσσαλονίκη, 12-16 Νοεμβρίου 2006). Thessaloniki.

Sagui, L. (ed.) (1998) *Ceramica in Italia: VI-VII secolo*, *Atti del Convegno in onore di John W. Hayes* (Rome, 1995). Florence.

Villeneuve, E. and Watson, P. (eds.) (2001) *La céramique byzantine et proto-islamique en Syrie-Jordanie (IVe-VIIIe siècles apr. J.-C.)* (Amman, 1994). Beirut.

See also the series of the Association Internationale pour l'Etude des Céramiques Médiévales en Méditerranée (AIECM2) congresses: Valbonne, 1978, Toledo, 1981, Siena-Faenza, 1984,

Lisbon, 1987, Rabat, 1991, Aix-en-Provence, 1995, Thessaloniki, 1999, Ciudad Real, 2006, Venice, 2009, Silves-Mertola, 2012.

Some Late Antique Pottery typologies:

- Atlante I*: Carandini, A. (dir.), Anselmino, L., Pavolini, C., Saguì, L., Tortorella, S. and Tortorici, E. (1981) *Atlante delle forme ceramiche, I. Ceramica fine romana nel Bacino mediterraneo (medio e tardo impero)*. Enciclopedia dell'arte antica, Rome.
- Bailey, D. (1988) *A Catalogue of the Lamps in the British Museum, III, Roman Provincial Lamps*. London.
- Bernal Casasola, D. and Ribera i Lacomba, A (eds.) (2008) *Cerámicas hispanorromanas. Un estado de la cuestión*. Cadiz.
- (2012) *Cerámicas hispanorromanas II. Producciones regionales*. Cadiz.
- Bonifay, M. (2004). *Études sur la céramique romaine tardive d'Afrique*, British Archaeological Reports IS 1301, Oxford.
- Brulet, R., Vilvorder, F. and Delage, R., with D. Laduron (2010) *La céramique romaine en Gaule du Nord. Dictionnaire des céramiques. La vaisselle à large diffusion*. Turnhout.
- Dixneuf, D. (2011) *Amphores égyptiennes. Production, typologie, contenu et diffusion (IIIe siècle avant J.-C.-IXe siècle après J.-C.)*, Études Alexandrines 22, Alexandria.
- Fontana, S. (1998) 'Le "imitazioni" della sigillata africana e le ceramiche da mensa italiche tardo-antiche', in Saguì (ed.) 1998: 83-100.
- Fulford, M. G. and Peacock, D. P. S. (1984). *Excavations at Carthage: The British Mission, Vol. I (ii). The Avenue du President Habib Bourguiba, Salamambo: the pottery and other ceramic objects from the site*. Sheffield.
- Keay, S. J. (1984) *Late Roman amphorae in the Western Mediterranean. A typology and economic study: the Catalan evidence*. British Archaeological Reports IS 196, Oxford.
- Hayes, J. W. (1972) *Late Roman pottery*. London.
- Hayes, J. W. (1992) *Excavations at Saraçhane in Istanbul. Volume 2. The Pottery*. Princeton.
- Hayes, J. W. (2008), *The Athenian Agora, Volume XXXII, Roman Pottery, Fine-wares imports*. Princeton.
- Lamboglia, N. (1963) 'Nuove osservazioni sulla "terra sigillata chiara", II. Tipi C, Lucente e D', *RELig* 29: 145-212.
- Mukai, T. (forthcoming) *La céramique du groupe épiscopal d'Aradi/Sidi Jdidi (Tunisie)*. Roman and Late Antique Mediterranean Pottery, Oxford.
- Opait, A. (2004). *Local and Imported Ceramics in the Roman Province of Scythia (4th – 6th centuries AD)*, British Archaeological Reports IS 1274.
- Paz Peralta, J. A. (2008) 'Las producciones de terra sigillata hispánica intermedia y tardía', in Bernal Casasola and Ribera i Lacomba 2008: 497-540.
- Pieri, D. (2005) *Le commerce du vin oriental à l'époque byzantine (Ve-VIIe siècles). Le témoignage des amphores en Gaule*. Bibliothèque Archéologique et Historique 174, Beirut.
- Reynolds, P. (2005) 'Levantine amphorae from Cilicia to Gaza: a typology and analysis of regional production trends from the 1st to 7th centuries', in *LRCWI*: 563-611.
- (2013) 'Transport amphorae of the First to Seventh Centuries: Early Roman to Byzantine Periods', in W. Aylward, (ed.), *Excavations at Zeugma, Conducted by Oxford Archaeology, Volume II*, 93-161, Plates 43-74. The Packard Humanities Institute, Los Altos, California.
- Reynolds, P. and Waksman, S.Y. (2007) 'Beirut cooking wares, 2nd to 7th centuries: local forms and north Palestinian imports', *Berytus* 50: 59-81.
- Rigoir, J. (1968) 'Les sigillées paléochrétiennes grises et orangées', *Gallia* 26: 177-244.
- Sazanov, A. (1997) 'Les amphores de l'Antiquité tardive et du Haut Moyen-Age: continuité ou rupture? Le cas de la Mer Noire', in *La céramique médiévale en Méditerranée. Actes du 6e congrès de l'AIECM2* (Aix-en-Provence, Novembre 1998), ed. G. Démians d'Archimbaud. Aix-en-Provence: 87-102.
- Vokaer, A. (2011) *La Brittle Ware en Syrie. Production et diffusion d'une céramique culinaire de l'époque hellénistique à l'époque omeyyade*. Fouilles d'Apamée 2, Brussels.

Studies on production centres:

- Ballet, P. (1997) 'De l'Empire romain à la conquête arabe. Les productions céramiques égyptiennes', in *La céramique médiévale en Méditerranée. Actes du 6e congrès de l'AIECM2* (Aix-en-Provence, Novembre 1998), ed. G. Démians d'Archimbaud. Aix-en-Provence: 53-61.
- Barraud, D., Bonifay, M., Dridi, F. and Pichonneau, J.-F. (1998) 'L'industrie céramique de l'Antiquité tardive', in *Uthina (Oudhna), La redécouverte d'une ville antique de Tunisie*, eds. H. Ben Hassen and L. Maurin. Mémoires 2, Bordeaux, Paris and Tunis: 139-167.
- Ben Moussa, M. (2007) *La production de sigillées africaines. Recherches d'histoire et d'archéologie en Tunisie septentrionale et centrale*. Instrumenta 23, Barcelona.
- Diamanti, C. (2010), 'Stamped Late Roman/Proto-Byzantine amphoras from Halasarna of Kos', *Rei Cretariae Romanae Fautorvm Acta* 41: 1-8.
- Diamanti, C., Kouzeli, K. and Petridis, P. (2014) 'Archaeology and Archaeometry in Late Roman Greece: the case of mainland and insular settlements, workshops and imports', in *LRCW4*: 181-192.
- Didoumi, S. (2014) 'Local pottery production in the island of Cos, Greece from the early Byzantine period. A preliminary report', in *LRCW4*: 169-180.
- Mackensen, M. (1993) *Die spätantiken sigillata- und Lampentöpfereien von El Mahrine (Nordtunesien)*. Münchner Beiträge zur Vor- und Frühgeschichte 50, Munich.
- (1998) 'Centres of African red slip ware production in Tunisia from the late 5th to the 7th century', in Saguì (ed.) 1998: 23-40.
- Magrini, C. and Sbarra, F. (2010) *Late Roman Glazed Pottery in Carlino and in Central-East Europe*. British Archaeological Reports IS 2068, Oxford.
- Peacock, D. P. S., Bejaoui, F. and Ben Lazreg, N. (1990) 'Roman pottery production in central Tunisia', *JRA* 3: 59-84.
- Pernon, J. and C. (1990) *Les potiers de Portout, Productions, activités et cadre de vie d'un atelier au Ve s. ap. J.-C. en Savoie*. RAN Suppl. 20, Paris.
- Pétridis, P. (2010) *La céramique protobyzantine de Delphes : une production et son contexte*. Fouilles de Delphes V, Athens.

Studies on ceramic distribution:

- Bes, P. (forthcoming) *A Geographical and Chronological Study of the Distribution and Consumption of Tablewares in the Roman East*. Roman and Late Antique Mediterranean Pottery, Oxford.
- Bonifay, M. (ed.) (2003) 'Table-Ronde "De Rome à Byzance; de Fostat à Cordoue. Evolution des faciès céramiques en Méditerranée, Ve-IXe siècles"', in *VIIème Congrès International sur la Céramique Médiévale en Méditerranée Thessaloniki* (1999), ed. C. Bakirtzis. Athens: 523-594.
- Bonifay, M. and Raynaud, C. (2007) 'Les échanges et la consommation', in Heijmans, M. and Guyon, J. (eds.), 'Antiquité tardive, haut Moyen Age et premiers temps chrétiens en Gaule méridionale, 2', *Gallia* 64: 93-161.
- Domzalski, K. (2000) 'notes on late Roman red slip wares in the bosporan kingdom', in *RCRF Acta* 36: 161-168.
- Fentress, L., Fontana, S., Hitchner, B. and Perkins, P. (2004) 'Accounting for ARS: Fineware and Sites in Sicily and Africa', in *Side by Side Survey*, eds. S. Alcock and J. Clurry, Oxford: 147-162.
- Fernández, A. (2014) *El comercio tardoantiguo (ss. IV-VII) en el Noroeste Peninsular a través del registro cerámico de la Ría de Vigo*. Roman and Late Antique Mediterranean Pottery 5, Oxford.
- Karagiorgou, O. (2000) 'LRA2: a container for the military *annona* on the Danubian border?', in *Economy and exchange in the East Mediterranean during Late Antiquity* (Proceedings of a conference at Somerville College, Oxford, 29th May, 1999), eds. S. Kingsley and M. Decker. Oxford: 129-166.
- Leitch, V. (2013) 'Reconstructing history through pottery: the contribution of Roman N African cookwares', *JRA* 26: 281-306.
- Panella, C. (1989) 'Gli scambi nel Mediterraneo occidentale dal IV al VII secolo, dal punto di visto di alcune merci', in *Hommes et richesses dans l'Empire byzantin, I. Réalités byzantines*, Paris: 129-141.

- (1993) 'Merci e scambi nel Mediterraneo tardoantico', in *Storia di Roma, III, 2*, Turin: 613-697.
- (2013) 'Roma e gli altri. La cultura materiale al tempo di sacco di Alarico', in *The Sack of Rome in 410 AD. The Event, its Context and its Impact* (Rome, 4-6 November 2010). Palilia 28, Wiesbaden: 365-402.
- Panella, C., Sagui, L. (2001) 'Consumo e produzione a Roma tra tardoantico e altomedioevo: le merci, i contesti', in *Roma nell'alto medioevo. Settimane di studio del Centro Italiano di Studi sull'Alto Medioevo, XLVIII*. Spoleto: 757-820.
- Reynolds, P. (1995) *Trade in the Western Mediterranean AD 400-700: The Ceramic Evidence*, British Archaeological Reports IS 604, Oxford: 1995.
- (2010a) *Hispania and the Roman Mediterranean, AD 100-700. Ceramics and Trade*, London. For comment, see also the review by M. Bonifay in *Journal of Roman Archaeology* 24 (2011): 725-734.
- (2010b) 'Trade networks of the East, 3rd to 7th centuries: the view from Beirut (Lebanon) and Butrint (Albania) (fine wares, amphorae and kitchen wares)', in *LRCW3*: 89-114.
- Current trends:
- Capelli, C., Bonifay, M. (2007) 'Archéométrie et archéologie des céramiques africaines : une approche pluridisciplinaire', in *LRCW2*: 551-567.
- (2014) 'Archéométrie et archéologie des céramiques africaines : une approche pluridisciplinaire, 2. Nouvelles données sur la céramique culinaire et les amphores', in *LRCW4*: 235-254.
- Garnier, N., Silvino, T., Bernal Casasola, D. (2011) 'L'identification du contenu des amphores : huile, conserves de poissons et poissonnage', in *SFECAG, Actes du congrès d'Arles*, Marseilles: 397-416.
- Mackensen, M., Schneider, G. (2002) 'Production centres of African red slip ware (3rd-7th c.) in northern and central Tunisia: archaeological provenance and reference groups based on chemical analysis', *JRA* 15:121-158.
- (2006) 'Production centres of African red slip ware (2nd-3rd c.) in northern and central Tunisia: archeological provenance and reference groups based on chemical analysis', *JRA* 19: 163-190.
- Pecci, A. and Cau Ontiveros, M. A. (2010) 'Análisis de residuos orgánicos en ánforas: el problema de la resina y el aceite', in *Estudios sobre el Monte Testaccio (Roma) V*, eds. J. M. Blázquez Martínez and J. Remesal Rodríguez. Instrumenta 35, Barcelona: 593-600.
- Reynolds, P. (2008) 'Linear typologies and ceramic evolution', *Facta* 2: 61-88.
- Woodworth, M., Baeten, J., Bernal, D., Bonifay, M., Garnier, N., Keay, S., Pecci, A., Poblome (DITTO), J., Pollard, M., Richez, F., Tchernia, A. and Wilson, A. (forthcoming) 'CORONAM Project: first results on the content of African Keay 25 amphorae', in *Esposende Workshop on Archaeoanalytics* (Esposende, 2014).
- Historical and economical models in which Late Antique ceramic data are involved:
- Arnaud, P. (2005) *Les routes de la navigation antique. Itinéraires en Méditerranée*. Paris.
- Bernal Casasola, D. (2010) 'Iglesia, producción y comercio en el Mediterráneo tardoantigo. De las ánforas a los talleres eclesiásticos', in *LRCW3*: 19-31.
- Loseby, S. (2007) 'The ceramic data and the transformation of the Roman world', in *LRCW2*: 1-14.
- Mattingly, D. J. (2011) *Imperialism, power and identity. Experiencing the Roman Empire*, Princeton.
- Peña, J. T. (1998) 'The mobilization of state olive oil in Roman Africa: the evidence of late 4th-c. ostraca from Carthage', in *Carthage Papers : the Early Colony's Economy, Water Supply, a Public Bath, and the Mobilization of State Olive Oil*. JRA Suppl. Ser. 28, Portsmouth, Rhode Islands: 117-238.
- Sodini, J.-P. (2000) 'Productions et échanges dans le monde protobyzantin (IVe-VIIe s.) : le cas de la céramique', in *Byzanz als Raum. Zu Methoden und Inhalten der historischen Geographie des Östlichen Mittelmeerraumes*, eds. K. Belke, F. Hild, J. Koder, P. Soustal. Vienna: 181-196.
- Tchernia, A. (2011) *Les Romains et le commerce*. Etudes VIII, Naples.
- Vera, D. (2010) 'Fisco, annona e commercio nel Mediterraneo tardoantico', in *LRCW3*: 1-23.

- Wickham, C. (2005) *Framing the early Middle Ages, Europe and the Mediterranean, 400-800*. Oxford.
- Wilson, A., Schörle, K. and Rice, C. (2012) 'Roman Ports and Mediterranean Connectivity', in *Rome, Portus and the Mediterranean*, ed. S. J. Keay. Archaeological Monographs 21, London: 367-392.
- Continuity:
- Armstrong, P. (2008) 'Trade in the east Mediterranean in the 8th century', in *Byzantine Trade, 4th-12th centuries*, ed. M. Mundell Mango. Farnham: 157-178.
- Poulou-Papadimitriou, N. and Nodarou, E. (2014) 'Transport vessels and maritime trade in the Aegean from the 5th to the 9th century AD. Preliminary results of the EU funded project "Pythagoras II": the Cretan case study', in *LRCW4*: 873-883.
- Reynolds, P. (In press) 'From Vandal *Africa* to Arab *Ifriqīya*: tracing ceramic and economic trends through the 5th to the 11th centuries', in 2012 Spring Symposium on *Rome Re-imagined: Byzantine North Africa, c. 400-800*, eds. J. Conant and S. Stevens. Dumbarton Oaks (Washington).
- Sagui, L., Ricci, R. and Romei, D. (1997). 'Nuovi dati ceramologici per la storia economica di Roma tra VII e VIII secolo', in *La céramique médiévale en Méditerranée. Actes du 6e congrès de l'AIECM2* (Aix-en-Provence, Novembre 1998), ed. G. Démians d'Archimbaud. Aix-en-Provence: 35-48.
- Vroom, J. (2003) *After Antiquity. Ceramics and Society in the Aegean from the 7th to 20th Century A.C. A Case Study from Boeotia, Central Greece*. Archaeological Studies 10, Leiden.
- Other references:
- Bien, S. (2007) La vaisselle et les amphores en usage à Marseille au VIIe siècle et au début du VIIIe siècle b: première ébauche de typologie évolutive, in *LRCW2*: 263-274.
- Bonifay, M. and Capelli, C. (2013) 'Les Thermes du Levant à Leptis Magna : Quatre contextes céramiques des IIIe et IVe siècles', *AntAfr* 49: 67-150.
- Hayes, 'Pottery', in A. H. S. Megaw Kourion. Excavations in the Episcopal Precinct. Dumbarton Oaks Research Library and Collection. Harvard University Press: 435-475.
- Fedoseev, N. F., Domžalski, K., Opaiț, A. and Kulikov, A. V. (2012) 'Post-Justinianic pottery deposit from Pantikapaion-Bosporos: Rescue excavations at 12, Teatral'Naja St. in Kerch, 2006', *Archeologia* 61 (2010): 63-94.
- Paroli, L., de Luca, I., Sbarra, F., Bortoletto, M. and Capelli, C. (2003) 'La cerámica invetriata altomedieval in Italia: un aggiornamento', in *La céramique médiévale en Méditerranée. Actes du 6e congrès de l'AIECM2* (Aix-en-Provence, Novembre 1998), ed. G. Démians d'Archimbaud. Aix-en-Provence: 477-490.
- Fournet, J.-L. and Pieri, D. (2008) 'Les dipinti amphoriques d'Antinoopolis', in *Antinneapolis I*, ed. R. Pintaudi. Florence: 175-216.
- Jackson, M., Zelle, M., Vandeput, L. and Köse, V. (2012) Primary evidence for Late Roman D Ware production in southern Asia Minor: a challenge to 'Cypriot Red Slip Ware', *Anatolian Studies* 62: 89-114.
- Mattingly D. J. (ed.) (forthcoming) Trans-Saharan Trade. Proceedings of the conference (Leicester, 28-30 April 2014).
- Sazanov, A. (2014) 'Cretan amphorae from the northern Black Sea region: Contexts, chronology, typology', in *LRCW4*: 399-409.
- Slane, K.W. and Sanders, G.D.R. (2005). 'Corinth: Late Roman horizons', *Hesperia* 74.2: 243-297.
- Swan, V. (2007). 'Dichin (Bulgaria): The fifth- and sixth- century destruction deposits, and their implications for ceramic chronology', in *LRCW2*: 835-844.
- Vroom J. (2007) 'The archaeology of Late Antique dining habits in the eastern Mediterranean: a preliminary study of the evidence', in *Objects in Context, Objects in Use. Material Spatiality in Late Antiquity*, eds. L. Lavan, E. Swift and T. Putzeys. Late Antique Archaeology 5, Leiden and Boston: 313-361.
- Yangaki, A. G. (2005) *La céramique des IVe - VIIIe siècles ap. J.-C. d'Eleutherna: sa place en Crète et dans le bassin égéen*. Athènes.

-
- ¹ Mackensen 1993.
- ² Peacock, Bejaoui, Ben Lazreg 1990.
- ³ Vroom 2007.
- ⁴ Fulford and Peacock 1984.
- ⁵ Ben Moussa 2007.
- ⁶ Oudhna: Barraud *et al.* 1998; Atelier “X”: Mackensen 1998; Mackensen and Schneider 2002.
- ⁷ Fentress *et al.* 2004; Bes forthcoming.
- ⁸ Paz Peralta 2008.
- ⁹ Brulet, Vilvorder and Delage 2010: 216-253.
- ¹⁰ Lamboglia 1963; Pernon and Pernon 1990.
- ¹¹ Fontana 1998.
- ¹² Rigoir 1968.
- ¹³ Brulet, Vilvorder and Delage 2010: 296-299.
- ¹⁴ Magrini and Sbarra 2010.
- ¹⁵ Paroli *et al.* 2003.
- ¹⁶ Hayes 1972, 2008; *Atlante I*.
- ¹⁷ *Atlante II*; Domžalski 2000.120
- ¹⁸ Jackson *et al.* 2012.
- ¹⁹ Armstrong 2008.
- ²⁰ Reynolds 2008, 2010.
- ²¹ Fernández 2014.
- ²² Arthur 2007b: 15-27.
- ²³ Leitch 2013.
- ²⁴ Bonifay, Capelli *et al.* 2013: table 34.
- ²⁵ Arthur 2007a and b; C. Raynaud in LRCW2: 247-262.
- ²⁶ Cau Ontiveros: his paper in LRCW 5 (Alexandria 2014); Cau Ontiveros 2014.
- ²⁷ Vokaer 2011.
- ²⁸ Reynolds and Waksman 2010.
- ²⁹ Hayes 2007.
- ³⁰ Armstrong 2008.
- ³¹ Slane and Sanders 2005.
- ³² Fernández 2014.
- ³³ Woodworth *et al.* forthcoming.
- ³⁴ Peña 1998.
- ³⁵ Bernal Casasola and Ribera i Lacomba 2008, 2012.
- ³⁶ Cassiodorus, *Variae*, XII, 12.
- ³⁷ Reynolds 2010b.
- ³⁸ Reynolds 2008.
- ³⁹ Fournet and Pieri 2008.
- ⁴⁰ Reynolds 2005 and Pieri 2005, with references.
- ⁴¹ Reynolds 2013.
- ⁴² Reynolds 2010.
- ⁴³ Didoumi 2014.
- ⁴⁴ Opaïț 2014, in LRCW4.
- ⁴⁵ **Diamanti 2010**; Diamanti, Kouzeli, and Petridis 2014, with bibliography; Didoumi 2014.
- ⁴⁶ Karagiorgou 2000; Swan 2007.
- ⁴⁷ Sazanov 2014 and Fedoseev *et al.* 2012.
- ⁴⁸ Poulou-Papadimitriou and Nodarou 2014, with references; Hayes 1992.
- ⁴⁹ The works of e.g. Zeest, Radelscu, Selov, Paraschiv, Opaïț and Dycek, See Opaïț 2004, with references; also the *Fautores Acta* and *LRCW*, *passim*.
- ⁵⁰ Fedoseev *et al.* 2012.
- ⁵¹ *LRFW1*.
- ⁵² Reynolds 2010.
- ⁵³ Capelli and Bonifay 2007, 2014; Mackensen and Schneider 2002, 2006.
- ⁵⁴ Reynolds 2010: 197-232.
- ⁵⁵ Pecci and Cau Ontiveros 2010; Garnier *et al.* 2011.
- ⁵⁶ Bernal Casasola 2007.
- ⁵⁷ Arnaud 2005.

⁵⁸ Reynolds 2010.

⁵⁹ For Atlantic connections, see Fernández 2014. For Trans-Saharan trade, see Mattingly (ed.) forthcoming.

⁶⁰ Tchernia 2011, 142.