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REFLECTIONS ON HOW TO MOST EFFICIENTLY PROCESS AND PUBLISH CERAMIC MATERIAL

John Lund, Jeroen Poblome and Daniele Malfitana

THE NATIONAL MUSEUM OF DENMARK, UNIVERSITY OF LEUVEN, AND IBAM-CNR-ITALY

Abstract

The essay addresses an issue of key importance to scholars engaged in the study of ancient pottery, namely how to most efficiently record, study and publish ceramic material from archaeological fieldwork in the 21st century. Departing from a critical assessment of the concepts of “undiagnostic” and “diagnostic” pottery, the authors highlight some of the inherent problems in dealing with the vast quantities of finds from archaeological projects in the Mediterranean and discuss some new approaches to the processing of ceramic finds from surveys. They argue that pottery experts ought to be equipped with a new set of efficient tools to help them automate and speed up the work. Even relatively simple standardised devices (to assist for instance in the drawing of pottery profiles) would be most helpful – in particular if combined with computer programs using Artificial Intelligence to help classify the sherds. The paper also explores ways of speeding up the processing of ceramic finds for publications, suggesting new and more efficient ways of making the results available to other researchers. It is concluded that pottery is well placed to provide “Big Data”. But in the case of ceramics from archaeological field projects, the data is almost too big – unless new ways of ways of coping with the thousands and thousands of sherds brought to light. For this to be achieved, it would be necessary to launch a multifaceted international project aimed at developing the tools required for automating the recording of the finds and to simplify and speed up the publication process.

Keywords

Methodology, diagnostic pottery, undiagnostic pottery, processing ceramic finds from field work, fuzzy pottery chronologies, survey pottery, Munsell colour codes, tools for drawing pottery profiles, regional approaches, “Big Data”

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The last decades have witnessed a surge in the number of scholarly publications dealing with archaeological theory, but there has not been a corresponding increase in literature on methodology. The two are of course closely linked,¹ but the topic of this paper is probably more related to methodology than to theory.

Like most other professionals, archaeologists are constantly confronted with the dilemma of how to get the most out of the available, often scarce economic resources allocated to their research. This essay focuses on one aspect of this issue: namely how to most efficiently record, study and publish ceramic material from archaeological fieldwork in the 21st century.²

No meaningful study of the overarching questions of pottery production, circulation and consumption can be attempted unless we are able to categorize, quantify and publish ceramic material, and one of the basic problems in attempting to do this is how to address the so-called non-diagnostic pottery.

Definition of “diagnostic” and “non-diagnostic”

How to define the term “diagnostic”? The Oxford English Dictionary on line, which describes itself as “the definitive record of the English language” offers two definitions, of which the first is: “concerned with the diagnosis of illness or other problems ...”. The second definition is obviously more relevant to

1. Johnson 2010, 2. However, see Olsen 2003, 15. Ceci and Valenzano 2016.
2. Poblome *et al.* 2006 addresses some of the same issues as the present contribution, but from a more theoretical perspective. See also Poblome and Bes 2018.

us: “characteristic of a particular species, genus, or phenomenon”.³ For some pottery specialists, “diagnostic” is a synonym for “rims, handles and bases”, but this is hardly satisfactory, since no one would presumably refer to a body sherd of an Attic Black figure amphora by Exekias as “non-diagnostic”. To most pottery experts “diagnostic” probably implies that we can at a minimum determine: 1) which ceramic ware we are dealing with; 2) where and 3) when it was produced? Obviously, some archaeologists might wish to add further questions to this shortlist, but to keep matters simple we wish to stick with the three issues. By implication, pottery characterized as “non-diagnostic”, a word that incidentally cannot be looked up in the Oxford English Dictionary on line, is ceramics for which these three questions cannot be answered.

It is necessary to stress the human factor in all of this. Much depends on the knowledge and experience of the specialist, who is processing the sherds in question, but even the very best are sometimes baffled, and identifications are not always 100% certain, as noted by John W. Hayes: “What in fact you normally receive is a degree of probability – though this is rarely specified. An analogy would be a faunal report claiming that a bone (or a skeleton) of that well-known animal the “sheep-goat” is 70 per cent sheep, 30 per cent goat – which end of the animal is which and did it have a beard”. Hayes went on to say “Repeat the experiment, in the correct scientific manner, with a new ceramic expert, whose knowledge is of course based on finds from different places, and rather different results will be encountered – our sheep-goat suddenly becomes 50 per cent, and not 30 per cent goat, as it were, and the so-called “science” in the experiment becomes questionable”.⁴

Someone starting out on a career as a pottery specialist – or working in an unfamiliar geographical area – will naturally be more prone to get things wrong than someone like John Hayes. Our newcomer is bound to classify far more sherds as non-diagnostic than him, which again illustrates how flexible the meaning of the words “diagnostic” and “non-diagnostic” are.

Is the term non-diagnostic meaningful?

One may question whether “non-diagnostic” is a meaningful term at all from a ceramic point of view, seeing that it is always possible to say something about any given sherd. We are, for instance, surely dealing with either

3. <http://www.oxforddictionaries.com/definition/english/diagnostic>, accessed on the 3rd of October 2018.
4. Hayes 2000, 105-106.

a fragment of a body, a base, a rim or a handle, and the sherd has a definite size, colour, thickness and fabric. True, such descriptions do not answer the overarching questions we are primarily interested in, but they are relevant to other issues of interest.

The size of a sherd can, for instance, tell us something about “afterlife” of pottery such as residuality or intrusiveness, as Theodore Peña suggested in 1998: “a systematic correlation between a particular pottery class or form and either a low degree of vessel completeness or a high degree of vessel brokenness may be taken as strong evidence that the given pottery class or form is residual”⁵

It should not be forgotten either that it is possible to subject any sherd to thin section or other kinds of scientific clay analyses such as XRD or NAA, which has the potential of revealing its geographical source, and thermoluminescence analysis, which might give an indication of when it was made – even if the latter method is unlikely to produce a precise date for the periods we are concerned with in HEROM.

The fact that such scientific clay analyses might inform us about the approximate date and possibly also the geographical source of nearly all sherds (in addition to the information that may be derived from their size, weathering *etc.*), demonstrates once more the elusiveness of the two terms. If we disposed of enough time and money to carry out scientific analysis of everything, well-nigh every “non-diagnostic” sherd could be made “diagnostic”, but in the real world this is, of course, not a realistic option.

Un-diagnosing diagnostic ceramic material

“Diagnostic” pottery is not without problems of its own, at least if it is defined as pottery for which we know the answer to all three questions posed at the outset of this essay. Because it is not really helpful to know which ceramic ware (and shape) we are dealing with, unless we also have knowledge of approximately where and when it was produced.

5. Peña 1998, 12. See also Poblome *in press*: “In general, the most distinctive feature of sherds reused in a terracing or construction fill may be their small size. This may have been caused by removing and thus reworking deposits from elsewhere”.

To take a concrete example, it is fairly straightforward to identify a rim or base as Eastern Sigillata A Ware (ESA) of Hayes form 4 A.⁶ But we have no certain knowledge of the geographical source of this ware because the kilns producing it have not yet been discovered. True, scientific clay analyses and traditional archaeological methods combine to suggest that they were situated somewhere in North Western Syria or Smooth Cilicia, but this still leaves the door open to several possible locations, such as the areas of Antioch, Seleucia ad Pieria, Rhosos or Tarsus – or perhaps a combination of two or more of these?⁷ As a matter of fact, we only have certain knowledge of the precise geographical location of few of the kilns that produced the sigillata wares of the Eastern Mediterranean: those at Pergamon, Çandarlı and Sagalassos.⁸ It is no less difficult to pinpoint the geographical source of many other wares, for instance the most popular transport amphorae of Late Antiquity, of the type Late Roman 1, which was produced in a wide geographical region that comprised much of the southern coast of Turkey as well as Southern Cyprus. A certain distinction between Late Roman 1 amphorae produced in Cyprus and those of Asia Minor can only be made through clay analyses.

Dating the so-called “diagnostic” ceramics is just as tricky. Based on the best available evidence, John Hayes dated ESA form 4 A between about the late second century BC and 10-20 AD. But it is not entirely clear precisely what is implied by this range of years? The period of manufacture? Marketing? Use (in the widest sense of this word) or discard? This is a million-dollar question which could easily be the topic of several conferences by itself, but we subscribe to the view that as long as the chronology of a given artefact type is based on its occurrences in independently dated contexts of use and/or discard (as is nearly always the case), then we cannot date anything but the use and/or discard of the artefact in question – not its production as such.⁹

Even if we leave this issue aside, the date range suggested by Hayes for ESA form 4 A still leaves us with a time span of more than 100 years within which the plate in question could have been produced, acquired and used. But things are complicated further by the “life cycle” of Roman pottery, a model launched in 2007 by Theodore Peña, who identified the following phases in the “life” of a pot: its Manufacture, Distribution, Prime Use, Reuse,

6. Hayes 1985, 15-16.

7. Lund *et al.* 2006, 2008 [2009].

8. Loeschcke 1912; Poblome *et al.* 2001.

9. Lund 2010.

Maintenance, Recycling, Discard and Reclamation.¹⁰ It is necessary to distinguish between these phases when attempting to date ceramic vessels found in any context. But this is often very difficult to do, except in the certain special cases, for instance those which involved a physical modification of the vessels.

This leads us to agree with Martin Millett's observation that "pottery chronologies are neither absolute nor precise but are the result of a process of generalization and interpretation which make them inherently fuzzy", and we think that the same applies to our identification of wares and their geographical sources.¹¹ Considering the role pottery often plays in reconstructing the general chronology of excavated sites and surveyed regions, it is important to stress that the dates pottery specialists propose are more often than not of a relative chronological value only, as in having no reference to an external chronological framework and not displaying equal units of measurement of time.

Rounding up the unusual suspects

A possible way out of some of these dilemmas was recently proposed by Kristina Winther Jacobsen in her analysis of the pottery from the Hellenistic, Roman and Late Antique periods found by the "Troodos Archaeological and Environmental Survey project in Cyprus". She noted that "Instead of the traditional separation of Cypriote pottery into fine, plain and coarse wares ... pottery was sorted according to a functional typology. The bulk of survey material is an enormous amount of so-called un-diagnostic plain and coarse ware body sherds, a group of pottery relatively little known". The functional typology applied to the material from the Hellenistic, Roman and Late Antique periods comprises six categories: "architectural fragments ..., cooking wares ..., light and heavy utility wares ..., transport amphorae ... and table wares", and Winther-Jacobsen notes that "any sherd that does not belong to any of the more easily recognizable functions is registered as "utility wares" ... and is divided into two categories: light and heavy utility. The distinction between sherds of light and heavy utility is arbitrary: a fixed wall thickness of 8 mm".¹² To illustrate how the system works, a comparison is made between what is called "the ceramic profile", i.e. the relative proportions of each of these categories, at four Late Antique sites in Cyprus. It is easy to

10. Peña 2007; Lawall and Lund 2011.

11. Millett 2000, 54.

12. Winther-Jacobsen 2009; Winther-Jacobsen 2010.

see that there are considerable variations between these sites, which presumably correspond to functional differentiation. There is no reason to repeat Winther-Jacobsen's detailed conclusions, but this brief presentation of her approach hopefully gives an idea of its potential. It is not supposed to supersede the traditional classification methods as feared by some observers,¹³ but to supplement them.

Yet, the Troodos survey was not the first archaeological project to attempt to determine the functionality of a site from a scrutiny of its ceramic spectrum. As cases in point, we may mention T.M. Whitelaw's work in Keos, Franziska Lang's work on survey material from Western Greece,¹⁴ and the approach applied by the ceramic specialists to the Tanagra Project. They divided the ceramic material into "six different functional categories: 1. Agricultural production, containing the local and regional line of amphora production and local products such as beehives, 2.-3. Beverage and food consumption represented by respectively drinking cups, and bowls and dishes forming part of a tableware assemblage, 4. Food processing containing all types of cooking ware, 5. Storage with mainly jugs, jars and containers, and 6. Transport, represented by the types of amphorae imported into Tanagra".¹⁵ Some of these categories correspond with those of the Troodos project, others not, and the distinction between some of them may be open to discussion, but the point is that the "ceramic profile" varies from one place to the other in the survey area.

Old answers to old questions

Before looking for other new approaches we might do well to remind ourselves of some old ones, which are, however, fairly seldom implemented even today. Several are described in the five volumes of the so-called "Populus Project", particularly the one called "Extracting Meaning from Ploughsoil Assemblages", which came out in 2000.

The first concerns the need to combine surveys with excavations,¹⁶ which ought to provide us with a typological and chronological framework for the pottery finds scattered on the surface of the ground – and thus reduce the number of un-identified sherds. To combine excavations and surveys is also important from another point of view, because it appears – as first

13. Nys 2008, 74.

14. Whitlaw 1998; 2000; Lang 2003; Lang *et al.* 2007.

15. Poblome *et al.* 2004-2005 [2007].

16. Hayes 2000, 107: "we must then integrate excavation with survey".

hypothesized by Anthony Snodgrass and John Bintliff – that surface finds are generally of a more recent date than those found in the earth.¹⁷ Such integrated approaches are still relatively rare for the Eastern Mediterranean in the periods under consideration here,¹⁸ but the hypothesis put forward by Bintliff and Snodgrass has apparently been confirmed in Cyprus, at the site of Kopetra,¹⁹ and also in other parts of the ancient world. It remains to be seen, however, whether this is a global phenomenon or one that is dependent on certain soil types.

A second approach which we should like to advocate is the need for regional studies, preferably over an extended period of time, which is incidentally also the best way to ensure that the involved pottery specialists become familiar with the ceramic wares circulating in the study area. The Boeotia survey and the Sagalassos Project are excellent large-scale examples of this, but the these and other survey projects show that much can be achieved with smaller resources.²⁰

What about new answers? First of all, we wish to stress that archaeologists should focus on managing resources better in the future when recording and publishing ceramic material than has perhaps been done in the past.

Pottery processing in the field

The degree of precision with which we are able to identify and study our pottery is directly related to the economic resources at hand. Surveys and excavations are apt to produce many thousands of sherds and other kinds of finds, and to process these is an expensive and time-consuming business. Assuming that we are dealing with a project yielding – say – 10.000 sherds, and that a pottery expert on average spends three minutes on each, then it would take her or him 62 days (working eight hours a day without free week-ends) to process everything. In reality, three minutes is probably a minimum, since one should not only think about the time it takes to examine a sherd, note its fabric and Munsell colour, identify – if possible – its form, and to enter this information into a computer, perhaps draw it and then put it back

17. Snodgrass and Bintliff 1991.

18. Lund 1993, 457-458, 471-472; Rautman 2002, 208 fig. 7; Wriedt-Sørensen 2006, 46-51; Lund 2007.

19. Cf. for Cyprus, Marcus Rautmann's work at Kopetra in Cyprus, and the Danish project in the Akamas, Lund 2007, and at Aradippou, Methenitis 2006. For a comparison involving two Bronze Age sites in Cyprus, see Swiny 2004, 61.

20. For instance, Meyer and Gregory 2003; Lund 2015 and Bintliff *et al.* 2017.

into its box and store it, before a new box crammed with pottery can be brought out.

The greatest assistance one could render a pottery expert would be to provide her or him with tools to help automate and speed up the work. Most pottery experts can be likened to highly skilled doctors, who are expected to perform complex operations with surgical instruments and other apparatus from the early 20th century. Natural scientists, architects and other members of archaeological projects frequently have sophisticated gear and computer programmes at their disposal, but pottery experts are in many cases left at their own devices.

Alternatively, projects might consider to invest in making the team larger, providing helping hands to the pottery specialists, or to balance better the generation of new finds through excavation or survey in the field with the time it takes to process the material. Building on experience, one week of fieldwork at Sagalassos, for instance, generates three weeks of work processing the finds resulting in basic graphic and photographic documentation and a quick scan of the pottery materials in order to help build the chronological framework of the surveyed area or the excavated stratigraphy and crude information on provenance and functionalities.²¹ Providing the ‘real’ answers to the standard archaeological questions takes at least as much time as it does on other sites and for other projects, after which the publishing process still needs to start. Project directors and stakeholding authorities are not necessarily aware of these proportions, and if they can rarely fully cater to these genuine needs.

It was certainly a big step forward when the Munsell colour codes came into use as a standardised way of describing clay colours by archaeologists working in the Mediterranean in the mid 1970’s.²² But different people perceive colours differently,²³ which frankly speaking often render the seemingly objective Munsell colour determinations extremely difficult. It would be helpful, for instance, if colour determination of ceramic fabrics could be done automatically by means of an electronic sensor instead of using the naked eye. Such devices already exist, but they are hardly in general use. An

21. Poblome and Bes 2018.

22. Spennemann *et al.* 1986. The use of the Munsell soil colour charts by John W. Hayes and John A. Riley in their preliminary publication of pottery from the University of Michigan excavations in Carthage in 1975 (Hayes and Riley 1976) seems to have introduced the system to the Mediterranean and definitely contributed to its rapid spread there.

23. Cf., for instance, Frankel 1980 and Tomber and Dore 1998, 6: “The consistent application of the Munsell charts has frequently been called into question”.

automated approach would have the additional benefit of eliminating uncertainties caused by the fact that different people perceive colours differently.²⁴ Other recurring criteria to classify fabrics include hardness, for instance, which is another measurement prone to take time when done properly, or with a very relative outcome when done on the go.

Another much needed device, which is not commonly used in the Mediterranean East, is a standard tool for drawing accurate profiles of pots and sherds, ideally combined with a program that could help identify the type of pottery in question using Artificial Intelligence.²⁵ This may in fact already be happening, since a method for automated pottery identification using hand-held smart device technology is currently being tested for scanning and classifying archaeological artefacts.²⁶ If it can truly identify the ceramics involved, it adds a further dimension to the enterprise. But it seems that this device works best – or solely – with wholly preserved pots, which is somewhat unfortunate, since nearly all ceramic material from excavations and surveys in settlements and sanctuaries is made up of sherds.

Further related to basic documentation, aiding classification in the field, why are there not more publications or apps around of the nature of Roberta Tomber and John Dore's "National Roman Fabric Reference Collection" or Raymond Brulet, Fabienne Vilvorder and Richard Delage's "La céramique romaine en Gaule du Nord. Dictionnaire des céramiques?"²⁷ Why does the international scholarly community not get its head round this issue, why do national managing authorities not create the frameworks for this to happen, and why would this be the first research project proposal to be rejected by funding agencies?²⁸ Is the elementary not good enough, or do we, as pottery specialists, manage insufficiently to explain why such investments would make a world of difference, not only to ourselves?

A further little explored avenue to increase the efficiency of research time as well as the potential of usefully sharing and co-creating information as a community, is the embracing of existing platforms aimed at standardiza-

24. Ferguson 2014.

25. Many such instruments have been developed by individuals for their private use, but no company has to my knowledge developed a standard package of software and gadgets to assist the pottery expert. The reason is presumably that they perceive that there is hardly any commercial market for these sorts of things.

26. Tyukin *et al.* 2018. See also Piccoli *et al.* 2015.

27. Tomber and Dore 1998; Brulet *et al.* 2010.

28. For a project of this nature that is in the process of succeeding against the odds, see Gattiglia 2018 and <http://www.archaide.eu/home>.

tion of information. CIDOC CRM,²⁹ for instance, is an international platform, conforming to ISO standards, providing an ontology for concepts and information relevant in the cultural heritage sector, with specific attention to, amongst others, the space-time dimensions and material things. All of a sudden we could be starting to talk the same language when describing our painstakingly sorted and classified study materials.

How to assist the publication process

Another point we wish to make concerns new ways of publishing the ceramic material more effectively than was often done in the past. Here again, the time has come to move from the “one man show” to a new level of international collaboration aimed at reducing the time involved – and hence the costs.

Most of us thus feel obliged to follow a certain traditional scheme when publishing pottery, which involves giving a lot of repetitive information about each ware, including a brief history of research, a general discussion of its fabric, date and source etc. Most of this might just as well be done by referring to a commonly agreed scheme, preferably one available on the internet. An example of this is the Southampton Roman amphora website,³⁰ which is an excellent frame of reference for the most common Roman amphora types. Something similar should be established for the other Roman wares, perhaps – as far as the fine wares of the Roman East are concerned – by the Levantine Ceramics Project (LCP),³¹ or more generally, by the *Rei Cretariae Romanae Fautores*, as a highly respected learned society with a very wide international audience and dealing with the very matter. But this is only a first step.

In the future, one might envisage the establishment of websites covering the total spectrum of pottery circulating in specific geographical regions – for instance in Cyprus. It would include templates, to be accessed by the pottery expert directly over the internet, and filled in “in situ” to create a living and developing record of the finds, as they come in. This might serve as an instant “publication” of the raw data, which other researchers could tap into, when given access by the project doing the work. Such a system would leave the pottery expert time to ponder the interpretation of the finds – instead of preparing endless and repetitive printed publications. But which institution

29. <http://www.cidoc-crm.org>, accessed on the 3rd of October 2018.

30. http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/index.cfm, accessed on the 3rd of October 2018.

31. <https://www.levantineceramics.org>, accessed on the 3rd of October 2018.

would finance – and which could manage – such a scheme? And would the different national archaeological authorities ever accept such a system?

Conclusions

To conclude, it seems to us that the terms “diagnostic” and “non-diagnostic” are so flexible as to be meaningless. Hardly any sherd is truly “non-diagnostic”, and aspects of the identification of the so-called “diagnostic” sherds are more open to discussion than is commonly recognized. Indeed, the term “non-diagnostic” implies that it is inherently impossible to say anything meaningful about an object so labelled, which is why it might be preferable to use instead the word “un-identified”, which leaves open a possibility of later identification.

The new approaches developed by the Troodos Archaeological project and the Tanagra project hold the promise of getting around such quandaries. Their most obvious limitation is that they will work best on one- or two-period sites with only one primary function. It is hard to envisage such methodologies used in connection with sites with a long history of occupation and use, and with complex and variable functions. Other than that, we should not forget the old answers, which have still not been generally applied, such as the need for combining surveys with excavations and to look at matters from a regional perspective.

We urge that efforts be focused on providing practical assistance to the pottery experts by developing tools that might help automate the recording of the finds and also simplify and speed up the publication process. But such initiatives would call for a hitherto unseen international collaboration, and for the allocation of substantial economic funds, and we cannot see that happening anytime soon.

There is a growing realization among archaeologists that “Big Data” can provide answers to many of our research questions concerning ancient societies. And ceramic material is well placed to provide such “Big Data”, precisely because potsherds are ubiquitous in archaeological excavations and because they encapsulate a wealth of information. But in the case of ceramics, the data is almost too big – unless we can develop new ways of coping with the thousands and thousands of sherds. To achieve this, it would be necessary to launch a multifaceted project aimed at developing the tools required for automating the recording of the finds – and also simplify and speed up and

simplify the publication process. Cheaper and easier scientific clay analyses are but one element in such a project – but an important one. The project, we have in mind should ideally be developed in international collaboration between archaeologists, natural scientists, experts in Artificial Intelligence and computer programming etc.

But in the end, we must also recognize the limits of the information provided by ceramic finds. Ceramic material can only in rare cases provide us with specific information about short-term developments or about specific individuals, and we don't think that we can do anything to change this basic condition in the future. However, we remain convinced that ancient pottery is a unique source for elucidating developments over time, and for informing us about all sorts of relations between people – which is after all no mean feat at all.

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