POT CALLING THE KETTLE BLACK? CLASSIFYING RE-FIRED ROMAN COOKING POTS

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Introduction

Roman period cooking wares have been subjected to intensive research since the late 1970's as the application of scientific methods producing overwhelmingly accurate results both on mineralogical and chemical composition of archaeological ceramics has become a common stock in trade. The methods used to generate data on mineralogy or chemical composition[1] with an accuracy of parts per million (ppm) or even per billion (ppb) are now commonplace in articles filling the pages of periodicals with the highest impact factors among the discipline of archaeology. However, while the end product – mineralogical or compositional data – and the method(s) used to derive it are customarily well-explained, much less information is provided regarding the selection of fabric samples consecutively subjected to scientific scrutiny.[2] This issue is anything but insignificant as the sample acquisition, whether based on random sampling or on a preliminary study providing the basis for sample selection, will significantly influence the results.

As this question is not usually dealt with sufficient depth in most publications, it is reasonable to assume that in the majority of the cases the assemblage has not been sampled at random. Instead, the specimens have been extracted for further analysis using an undefined criterion. One possible guiding factor in this context is undoubtedly representativeness, which can direct the sampling process towards the selection of average or extreme example(s) of a given fabric. But supposing that the classification has been somehow distorted from the beginning, the sample thus obtained may represent neither the average nor the extreme. In fact, it may not represent the projected fabric group at all. If one accepts the existence of factors distorting the classification, one should also be able to define their origin. In the case of certain pottery fabrics, like the focus of the present article, Roman period cooking wares, this does not seem to be overly difficult.

The issues related to fabric classification are depended, to a certain extent, on the type of pottery under examination. Roman fine wares, for example, are more often than not characterized by fairly homogeneous and featureless clay paste inhibiting reliable classification without additional indicators like slip color and distinctive features on the vessel form or decoration. On the other hand, the homogeneity of the output in fine wares that tend to show only moderate user induced alteration ensures con-

[1] On the application of petrography in archaeology, see Garrison 2003, pp. 153-206; for an introduction to analytical chemistry in archaeology, see e.g. Pollard *et alii* 2007.

[2] The situation is, however, more elaborated compared to pottery quantification. While quantitative data is customarily given out in pottery reports, the method of quantification is rarely described. On the advantages and disadvantages of various methods used to quantify Roman pottery, see Peña 2007a.

sistent results in archaeological classification. Following this line of reasoning, transport amphorae could be characterized as a class of intermediate variation – the regional production can be fairly heterogeneous, but the fabric characteristics are seldom masked by extensive use-alteration. From this point of view, the most heterogeneous category of Roman pottery is, already by definition, the group of common wares, among which the subgroup of cooking wares presents usually the most intensive signs of user induced alteration.[1]

In practice, user induced alteration in cooking wares is customarily detected in form of soot deposition, the density of which is potentially influenced by fabric related properties like temper, porosity and surface finish. In addition, the use of the vessel comprising both the mode of use and the time the given vessel remained in use, in other words use-life, in addition to vessel maintenance are factors contributing to "total" use alteration. The result of this variability is that certain types of Roman cooking wares show customarily more evidence on use-alteration than others. While aesthetics may have played some role in directing consumer behavior in antiquity,[2] the more important implications to be dealt with here are related to fabric classification.

One of geographical areas where great problems have been encountered in the classification of locally produced cooking wares is the city of Rome and its environs. The two main reasons for the difficulties are the uniform geology of this area[3] and the size of the market that was supported, in part,[4] by local workshops. The first factor implies that the differences between workshops are barely recognizable, if recognizable at all, through nuances in mineralogy and geochemistry.

Secondly, the demand for earthenware cooking vessels created by a population that quite possibly exceeded one million urbanites during the reign of Augustus obviously promoted the craft that was practiced either in vast units or in numerous small workshops. However, the archaeological evidence on Roman pottery workshops located in this area is generally rather scarce. The most convincing proof favoring the existence of significant number of small workshops is the heterogeneous form and fabric repertoire shown by local cooking wares, while archaeological evidence on large production centers is still lacking.

Possibly arising from the heterogeneous nature of evidence, arguments stressing the need to re-fire the cooking ware sherds before fabric classification is carried out were first expressed over two decades ago by Schuring,[5] as '*the initial division of the material, for which only a pocket lens was used, proved extremely difficult. Many of the fragments were not fully oxidized or soot had been deposited during cooking, making it very difficult even to see the inclusions*'. Nevertheless, re-firing as a pretreatment method for Roman cooking ware assemblages to be classified has not gained wider acceptance. To the knowledge of the author, in addition to Schuring's study on Roman and early Medieval pottery from San Sisto Vecchio, the method has been used only once.[6] The aim of the present article is to report the results of another re-firing experiment, and to review them in a wider context.

[1] On the prime use of various classes of Roman pottery, see Peña 2007b, pp. 39-60.
[2] Ikäheimo 2003, p. 100.
[3] See, e.g., Schuring 1986, pp. 183-185; Olcese 2003, pp. 50-51.
[4] On various classes of imported cooking wares in Rome, see, e.g., Ciotola 2000; Ciotola 2002.
[5] Schuring 1986, p. 159.
[6] Peña 1990, p. 650.

The quote in previous paragraph, which stresses the difficulty of classifying heterogeneously oxidized and varyingly sooted fragments of cooking ware with a pocket lens, or with a low-powered binocular microscope, is generally unobjectionable. The statement itself, however, is pretty straightforward and, more importantly, is not backed up with empirical data. The lack of data leads to a question about a hypothesis that could be formulated on the basis of Schuring's statement? For instance, assuming that the quality of classification could be improved by re-firing the cooking ware sherds to be examined, the resultant information should be easier to interpret as much of the use-alteration induced variability will be eliminated. Therefore, logical considerations suggest that a fabric classification executed with re-fired sherds should turn out be less nuanced. In the present article this question is reviewed through the examination of nearly hundred specimens that were subjected to two independent events of classification according to scheme to be outlined in the following section.

Materials and methods

The assemblage used for this purpose pertains to the Soprintendenza Archeologica di Roma and the American Academy in Rome joint excavations that focused on the remains of a post-Severan aristocratic *domus*,[1] preserved to a considerable extent by later fills and located on the northeastern slope of the Palatine Hill. The excavations concentrated in two trenches, the smaller of which was located on the upper slope (Sector D) and included the remains of a small fountain with water tanks, some adjacent structures and layers, all dating to the late 1st century AD. The larger trench on the lower slope included an apsidal hall in brick-faced concrete supported by a series of north-facing barrel-vaulted rooms (Sector B) and a set of smaller spaces, including additional apses and chambers (Sector A), built south of the apsidal hall by the early 4th century AD. The building and adjacent structures were abandoned fairly quickly in late Antiquity and used as rubbish dumps for building and household debris of unknown origin. At best, this activity resulted in fills of several meters in depth and including many consecutive layers of well preserved refuse in definable chronological sequences.[2]

The study assemblage to be discussed in this article consists of nearly one hundred (N = 97)[3] samples representing a pottery class called Regional cooking ware.[4] The vessels from which samples were derived represent four distinct archaeological contexts offering chronologically diverse snapshots to locally produced cooking wares that pertain to the period of 80/90-450/500 AD (Table 1). The principal reason for

[1] For more in-depth introduction to the site, see e.g. Hostetter *et alii* 1994; Hostetter - Brandt 2003.

[2] The Palatine East pottery assemblage, resulting from the 1989-1993 excavations, exceeds 20 metric tons in total weight and includes roughly 150 identified wares, most of which pertain to the Roman period. For more information, see Ikäheimo - Peña 2009.

[3] The number of samples taken in 1993 was originally 107. In closer examination, however, some of the samples turned out to belong to other pottery classes (e.g., transport amphorae) or other cooking wares of the Roman period (e.g., African cookware) and some vessels had even been sampled twice by accident.

[4] The term West-Central Italian Cookware has also been used (e.g., Peña 1999, pp. 122-132) to describe this fairly heterogeneous class of Roman pottery apparently produced by several workshops in the area of Latium and potentially also in Campania. The author is well aware that the term Regional cooking ware is a concise, yet somewhat vaguer, by definition.

preferring these pottery finds was their relatively high degree of completeness,[1] which may be used as an argument for interpreting their contexts as primary deposits. Hence, they should represent the same general state of preservation, while the relative integrity of the deposits significantly reduces the possibility of residual or intrusive materials being included in the analysis.

Context	Date (AD)	N
PED 83	80/90 – 100/110	16
PEA 105	300/310 – 310/320	27
PEA 22	320/325 – 350/360	26
PEB 180	400/425 450/500	28

N = number of samples used in the study.

TABLE 1. Breakdown of the study assemblage by context.

In August 1993 the samples were re-fired at the Laboratory of Soil Sciences of the Geology Department in the Oulu University (Finland). The samples were weighed before they were placed into a laboratory kiln, the temperature of which was gradually raised to 950 °C. After the samples had been soaked in this temperature in an oxidizing atmosphere for two hours, the kiln was allowed to cool down slowly. Thereafter, the samples were re-weighed and the relative weight loss or gain caused by the process of re-firing was determined.[2] In addition, possible changes in sherd color were recorded with the aid of Munsell Soil Color Charts. Finally, a binocular microscope providing magnifications 10-40× was used to identify various mineral grains, and to determine their size, shape and frequency. Together these variables served in the forming of fabric groups.

Another, but equally independent attempt to establish a fabric classification for the very same vessels was carried out in Rome between 1995 and 1996 with a set of un-refired samples as a part of larger program comprising the study of sherds pertaining to some 10,000 Roman cooking ware vessels from the Palatine East excavations. The work, which was mainly carried out with binocular microscope, resulted in preliminary classification of Regional cooking ware comprising six fabric groups that subsumed no less than 128 (sic!) preliminary fabric identifications. While the resolution of this fabric classification is bound to be changed by further research, the number of fabric groups will likely remain unaltered.

These six fabric groups (I-VI) are compatible to a great extent with the classification proposed by Peña (see TABLE 2) and they can be further divided into three fabric pairs with shared main characteristics: a) the scarcity of medium to large inclusions and substantially fine or compact matrices (fabric groups I-II), b) the presence of quartz-sand temper with or without sporadic mineral grains of volcanic origin (fabric groups III-IV) and c) the presence of coarse volcanic temper in a medium or rough

[1] On the definition of completeness, see ORTON - TYERS - VINCE 1993, pp. 167-171.

[2] Any change in the weight of a pottery sample is potentially controlled, at the very least, by two parameters: the porosity of the fabric and the thermal changes of minerals. Of them, the former is straightforwardly related to weight loss and is the function of apparent porosity; the latter may result in weight gain or loss, depending on the mineral composition and the thermal behavior of these components.

matrix (fabric groups V-VI). When the data gathered in 1993 is re-arranged according to this scheme, two independent fabric classifications using the same classificatory system and assemblage have been formed for further scrutiny. Next, the extent to which they overlap with one another will be examined.

	I	II	III	IV	V	VI
PED 83	6	1	4	2	3	–
PEA 105	10	4	7	1	3	2
PEA 22	9	1	8	3	3	2
PEB 180	3	3	9	8	4	1
Total	28	9	28	14	13	5
Fabric*	6b	6c	5d	5e	6d	6e

Fabric* = fabric codes as given in Peña 1999, 122-132.

TABLE 2. Classification of re-fired sherds by fabric groups.

RESULTS

The cross-tabulation of the data (TABLE 3) enables more objective evaluation of the results achieved with the fabric classification of 1993 based on re-fired sherds in contrast to fabric classification of 1995-1996 established with more traditional hands-on method. The results are somewhat astonishing as the percentage of concordant identifications is at the highest only 71.4 %, while in the opposite case only two fifths of the material seems to have been identified in a consistent manner. When the comparison is carried out on the level of fabric group pairs, the accuracy is raised to a formidable rate of 72.2-83.8 %. The apparent outcome of this comparison is, assuming that the variance observed cannot solely be attributed to the incompetence of the author, that the more nuanced the fabric classification turns out to be, the more inherent bias it likely contains. The next step, however, is to examine whether and to what extent the bias results from soot deposition. Before this is done, it is necessary to discuss the very nature of soot-deposition present on Roman period cooking ware vessels.

B/A	I	II	III	IV	V	VI	FG	FP
I	20	4	–	1	3	–	71,4	83,8
II	3	4	–	1	1	–	44,4	
III	4	1	17	6	–	–	60,7	76,2
IV	2	–	3	6	3	–	42,9	
V	2	1	–	–	7	3	53,6	72,2
VI	–	1	–	1	1	2	40,0	

B/A = fabric group attribution before/after re-firing
FG = correlation percent (%) within fabric group
FP = correlation percent (%) within fabric pair

TABLE 3. The correlation of pre- and post-firing attributions.

The examination of the appropriate data (TABLE 4) leads to some interesting observations.

Int./Ext.	0	1	2	3	4	5	6	Σ
0	3579	761	692	613	637	322	267	6871
1	34	27	44	36	24	11	11	187
2	49	18	30	56	126	23	36	338
3	20	6	26	62	11	7	29	161
Σ	3682	812	812	767	798	363	343	7557

The three zones – rim, exterior and interior – distinguished in each sherd were assigned the following values: 0. unsooted, 1. harsh soot, 2. patches of dense soot, 3. continuous cover of dense soot. The values for soot on rim and vessel exterior have been combined to enable cross-tabulation (hence the 0-6 scale).

TABLE 4. The rough distribution and the intensity of soot deposition.

Firstly, nearly one-half of the examples in the assemblage (≈ 47%) do not show user induced soot deposition on any surface. Together with the vessels displaying soot cover of varying density only on the exterior surface, these examples comprise 9/10 of the assemblage – 6871 out of 7557 sherds. The low number of sooted examples seems at first, perhaps, quite surprising. It becomes more understandable, however, when one takes into account that in post-excavation classification and documentation most vessels are usually represented by a single sherd preserving the rim and the upmost section of the vessel wall (FIG. 1). Extended sherd families[1] preserving the lower and also more likely sooted portion of the vessel, on the other hand, are considerably rarer. Therefore, due to high percentage of unsooted or only moderately sooted examples, one can reasonably continue to question Schuring's demand for the re-firing of sherds – at least until a method is developed to produce new data on the daily life of the Romans by identifying cooking ware wall fragments by specific fabric instead of generic ware.

As stated in the introductory section, the change in sample weight during re-firing is related both to the apparent porosity of the fabric and the way different minerals react to heat exceeding their original firing temperature. Within a fabric group, on the other hand, the combined effect of these two factors should be fairly consistent, while further variation in weight may be introduced by additional factors. One such factor is undoubtedly soot deposition, as the intensity soot cover may range from light patches on vessel exterior to a thick, heavy layer penetrating the wall all the way to vessel interior.

If not of post-depositional origin, the soot deposition on the exterior surface results most probably from vessel use in direct exposure to an open flame; and in extreme cases, as indicated above, it may impregnate partially or totally the vessel wall. An alternative use-related source for the soot on vessel interior is charred carbon derived from the contents of the vessel, whereas the combination of a darkened core

[1] On the concept of sherd family, see ORTON - TYERS - VINCE 1993, p. 172.

FIGURE 1. A wall fragment of Regional cookware pan from the Palatine East excavations showing soot deposition only on lower exterior surface. Photo: Samantha Scaringe.

with clean vessel surfaces is normally the product of insufficient firing time. The variation of firing patterns may occasionally be quite complex,[1] and can potentially coincide with a certain fabric. In such cases, it may be defined as a characteristic feature of a certain production. For a person trying to classify the multitude of fabrics, however, the origin of soot is in the majority of cases insignificant. In any case, it is thought to possess the undesired quality of obscuring transparent and translucent minerals into the dark clay matrix.

This premise can be tested quantitatively with the study assemblage by cross-tabulating the change in vessel color with the change in fabric attribution after re-firing. Logical considerations suggest that the denser the soot cover on the sherd is, the higher the probability that it will be classified into "wrong" fabric group. Here, a numeric expression for color change induced by re-firing was calculated from Munsell values determined before and after re-firing by using the function for the determination of three-dimensional vector ($= \sqrt{x^2 + y^2 + z^2}$). As x stood for hue, y for value and z for chroma, the value presenting the total color change, for example, from 5 YR 4/4 to 2.5 YR 5/8 is approximately 4.82 ($= \sqrt{2.5^2 + 1^2 + 4^2}$). The consistency of pre- and post firing fabric group attributions was evaluated using a three-staged scale: 0= attributed in both cases to the same fabric group, 1 = attributed after re-firing to other fabric group of the same fabric pair, and 2 = attributed after re-firing to another fabric pair.

The results indicate (TABLE 5) that more the color of the sample is changed in re-firing, the greater likelihood that it will be re-assigned to another fabric group. As the change in color is mainly caused by the oxidization of the clay matrix, while the contribution of non-plastics to the change is marginal if not non-existent, the main factor leading to reattribution might be the enhanced visibility of some mineral groups. From the data introduced previously (TABLE 3), it can be observed that the most common case of reattribution is such, where the fabric was initially thought to contain a significant component of quartz or volcanic sand. After re-firing, however, the sample was attributed to the first fabric group pair characterized by fine and/or compact

[1] E.g. ORTON - TYERS - VINCE 1993, p. 134.

matrix. This probably reflects the difficulty of drawing a line between fabrics in which the fine sand component represents intentionally induced temper and those, where fine sand is present as natural non-plastic component. Another important question to be discussed next is, whether the classification produced with re-fired sherds is more accurate or informative than the one accomplished without this additional step in the research design.

	0	1	2
N =	56	21	20
Average	2,62	2,99	3,83
Median	2,24	2,24	3,28
Skewness	1,15	0,80	0,80

TABLE 5. Quantification of the change in fabric color.

CONCLUSIONS

Classification has long been a fundamental aspect of archaeological research, including classical archaeology. At the very least, it represents in this context a convenient way to break down the Regional cooking ware assemblage into smaller manageable segments or units, which may have only a little or perhaps nothing to do with the way the Romans comprehended this sector of their material culture. But as our classifications and catalogues are directed to our contemporaries, this apparent defect is, perhaps, only of minor importance. Therefore, archaeological assemblages are basically grouped and classified for the creation of narratives for ourselves. Supposedly more accurate linkages to the past, established e.g. through re-firing Roman cooking ware samples, are thought to be essential in order to improve these narratives from bedtime stories to archaeological research, to which we intrinsically assign somewhat elevated status.

The subtext related to scientific methods suggesting that their use would produce more 'valid' or 'scientific' results can be equally challenged here. In the context of Roman pottery studies this has been exemplified by Blakely and his colleagues,[1] who applied independently petrography, xeroradiography and heavy mineral analysis to the classification of one and same assemblage of Internal Red-Slip Cooking ware. While the resolution of all methods was sufficient to separate 83 pots with volcanic temper from the only cooking pot tempered with quartz sand – a macroscopic examination would perhaps been enough to reveal this difference – the subcategories defined within the volcanic group were not internally consistent. Had any of these methods been applied alone, however, it would have produced results with sufficient scientific aura to legitimate any reasonable-sounding interpretation concerning the study assemblage.

From this point of view, the criticism expressed every now and then by various scholars towards the traditional method of fabric classification promulgated by Peacock,[2] in which all sherds "*… were examined and classified on the basis of their appearance*

[1] BLAKELEY - BRINKMANN - VITALIANO 1989. [2] PEACOCK 1977, p. 149.

under a hand lens," and "*…selected pieces were then studied in thin section under the petrological microscope to check the reality of the visual classification and to search for criteria diagnostic of origin*", is somewhat pointless. Yes, a ceramicist or a geologist specialized in ceramic petrography would always be useful when archaeological pottery is to be classified, and, yes, the traditional method of pottery classification does not leave an objective record of the thousands of sherds not selected for further analyses. None the less, it creates another valid interpretation of the study assemblage upon which archaeological narratives can be built.

By re-firing a selection of samples for further study, or by re-firing the whole assemblage or even by complementing either of these two research strategies with an extensive program of thin-sectioning, XRD or XRF, to name but a few, only a different data set for the interpretation of the assemblage is being created. But when the outcome of such research is turned to into an archaeological narrative, it might at first be weighed as more 'valid' or 'scientific' than a classification carried out with ordinary aids like a hand-lens or a stereoscopic microscope. Still, the inherent biases native for any research process are very likely the same or, at least, very similar to one another. Thus, the (radiant) past is only viewed through a translucent filter of a different kind, a piece of stained or sooted glass, the mere existence of which actually counts more than its color.

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ABSTRACT

This article will examine re-firing as a part of the research process focusing on Roman cooking wares. It will be pointed out that as an additional step in the procedure of fabric classification, re-firing is likely to yield different results from classification accomplished with sherds that have not undergone this process. The accuracy of classification, however, will not be significantly improved, as there are several inherent problems to the fabric classification itself. Hence, as in the case of pottery quantification, the results are more often than not indicative, and the existence of absolute fabric classification is merely a fiction than a realm in classical archaeology.

Il contributo riesamina il problema della ri-cottura del vasellame come parte di un più ampio progetto di ricerca sulle ceramiche da cucina di età romana. Appare ben evidenziato, come passaggio aggiuntivo nel processo di fabbricazione del vasellame, che la ricottura ottiene risultati diversi dalla classificazione se paragonati a quei manufatti che invece non hanno subito tale processo. L'accuratezza della classificazione, tuttavia, non sarà significativamente migliorata dal momento che ci sono molti problemi connessi col processo di fabbricazione stesso. Inoltre, come accade nei processi di quantificazione, i risultati appaiono talora indicativi e l'esistenza di un processo di produzione assoluta si configura più come una finzione che una acquisizione effettiva.

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