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## **Campana plaques from Ossaia – La Tufa (Cortona, Arezzo): from archaeological hypotheses to archaeometric results**

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**ABSTRACT.** — The Roman villa at Ossaia – La Tufa, near Cortona, was built during the late-Republican period and monumentalized in the Augustan period. In the second half of 1<sup>st</sup> cent. AD some parts of the villa were radically transformed and some of the rooms employed as productive workshops. The on-going excavations of the villa, have yielded a number of fragments of Campana plaques. The iconographic type attested by the plaques is that of an Siren standing on top of an acanthus tuft turned upside down, from which luxuriant flowered tendrils develop. Two very different levels of stylistical refinement have been recognized in the terracotta fragments: the first shows the typical features of the best productions of Late-Republican/Early-Imperial age, the second is a reproduction in poorer style of the same iconographic type. The aim of this work was to characterize these different productions in order to establish any connections with the sequence of rearrangements undergone by the monumental complex, and to clarify some aspects of production and circulation of Campana plaques.

The samples were characterized by means of stereoscopic and optical microscopy, and analyzed by scanning electron microscopy. At the same time, samples of urban production from Palatine Museum were characterized using the same methodologies, and then compared to the samples from Ossaia – La Tufa. The results point to the existence of two different groups of production, local and urban, of architectural terracottas in the Ossaia – La Tufa villa, corresponding to the different levels of stylistical refinement. Local production, in poorer

style, is characterized by the sole presence of a sedimentary fraction which has been attributed to local geological formations found in the Cortona area. Urban production, in high style, is characterized by the presence of a volcanic component which has been attributed to pyroclastic units of potassium alkaline magmatic rocks found in Latium and Campania. The archaeometric results have been interpreted assuming importation of the products in high style from Rome, in the period in which the villa probably passed into imperial property, and local production of the pieces in poorer style, in a subsequent period of decline occurred during the Flavian age.

**RIASSUNTO.** — La villa romana di Ossaia – La Tufa, costruita durante il periodo tardo repubblicano e monumentalizzata tra la metà del I secolo a.C. e l'età augustea, subì una modifica radicale nella seconda metà del I secolo d.C con la trasformazione di alcune stanze in impianti produttivi. Durante lo scavo archeologico, tuttora in corso, sono stati riportati alla luce vari frammenti di lastre Campana. Il tipo iconografico attestato dalle lastre è quello di una Sirena stante su un calice di acanto rovesciato da cui si sviluppano lussureggianti racemi floreali. Tale tipo iconografico, però, ricorre a Ossaia in due versioni sensibilmente differenti. La prima mostra i caratteri tipici della migliore produzione del periodo tardo repubblicano – proto imperiale, la seconda consiste invece in una riproduzione in stile deterioro dello stesso tipo iconografico. Lo scopo di questo lavoro è stato quello di caratterizzare le due diverse produzioni al fine di definire la connessione con la sequenza di cambiamenti intervenuti nel complesso monumentale, e di contribuire al chiarimento di

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alcuni aspetti della produzione e della circolazione delle lastre Campana.

I campioni sono stati esaminati allo stereomicroscopio e al microscopio ottico, e analizzati in microscopia elettronica a scansione. Allo stesso tempo, alcuni campioni di produzione urbana provenienti dal Museo Palatino sono stati caratterizzati mediante le stesse metodologie analitiche per essere poi comparati con i campioni di Ossaia – La Tufa. I risultati evidenziano l'esistenza di due diversi gruppi di produzione, locale e urbana, nell'ambito delle terrecotte architettoniche. La produzione locale, in stile deterioro, è caratterizzata dall'esclusiva presenza di una frazione sedimentaria riconducibile alle formazioni geologiche affioranti nei dintorni di Cortona. La produzione urbana, in bello stile, è caratterizzata dalla presenza di una componente vulcanica che è stata attribuita a unità piroclastiche di serie alcaline potassiche affioranti in Lazio e in Campania. I risultati archeometrici sono stati interpretati assumendo l'importazione dei prodotti di stile più elevato da Roma, probabilmente nel periodo in cui la villa divenne di proprietà imperiale, e la produzione locale dei prodotti in stile deterioro in un successivo periodo di trasformazione intervenuto in età flavia.

KEY WORDS: *Terracotta, Campana plaques, petrography, mineral chemistry, provenance.*

#### 1. THE VILLA AT OSSAIA/CORTONA: A CASE STUDY IN THE «ARCHAEOLOGY OF PRODUCTION»

The excavation of the Roman *villa* at Ossaia (Cortona, AR), undertaken in 1992 jointly by the University of Perugia and the University of Alberta (Canada), has uncovered the main residential area of one of the earliest villas so far documented in Northern Etruria. Thanks to the systematic and large scale nature of the ongoing exploration, the data retrieved provides much information on the long history of the complex, between ca. 100 B.C. and the Late Antique (mid-5th c. A.D.), its architectural lay-out and material culture (Fracchia and Gualtieri 1996). In the light of the most recent excavation data, it is also clear that the late-republican *villa* was built on the site of a pre-existing *vicus* (rural hamlet) dating back to the 5th century B.C., which may have had the dual purpose of a small nucleated settlement for the

rural population and the centre of a fairly sizable estate. Thus, the late Republican *villa*, in spite of the monumental architecture and impressive *pars urbana*, shown by its central residential nucleus (an elongated complex on the main terrace with a frontage of over 100 metres overlooking the lower Valdichiana - fig. 1), was certainly part of a larger productive context, developed over a span of a few centuries (Fracchia and Gualtieri 2001).

Thanks to the detailed documentation provided by the stamped tiles, already discussed elsewhere from the viewpoint of their production and distribution (Gualtieri 2000), we can better outline the major construction phases of the early complex (1st c. B.C.- 1st c. A.D.) and, at the same time, provide reasonable hypotheses about changes in the ownership of the estate in which the *villa* belonged. The first owner of the *villa* complex, to judge from a large number of stamps dated to the beginning of the 1st c. B.C., must have belonged to a local family of some means, bearing the Latin version of an Etruscan name well attested in the territory between Arretium and Cortona, ANILIUS or AVILIUS (Zamarchi Grassi 2001). Around the middle of the century, perhaps as a result of intermarriage, the estate passed into the hands of the VIBII (Pansae?) a well known family of ancient Etruscan descent from Perugia who is also known to have had connections with Cortona. Another exceptional group of stamps, on both brick and tiles, with CAESARUM (to be interpreted as *Cai and Lucii Caesarum*, on the basis of similar documentation available from a well known estate of Agrippa around Vibo Valentia in Southern Italy), provides an unquestionable piece of evidence for the transferring of the Ossaia *villa* into the Imperial  *fiscus* by the later first century B.C. This phase of the villa in which the *figlinae* belonged to the family of Augustus, also provides impressive documentation of architectural refinement (especially the well preserved area around the *atrium*) and interior decoration (the exceptional group of black and white mosaics laid by *musivarii* in close contact with urban

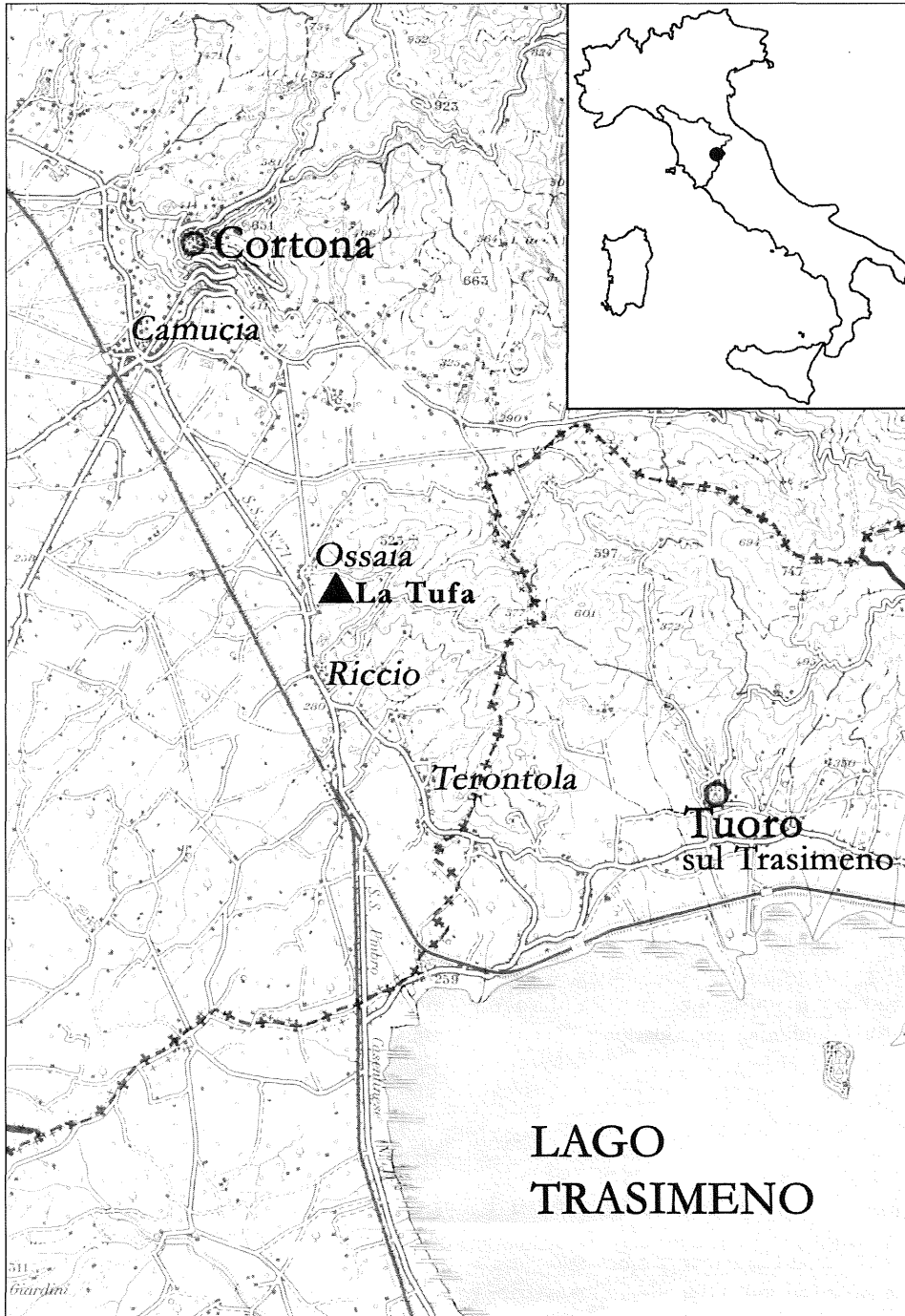


Fig. 1 – Sketch map of the Cortona area with location of the villa at Ossaia – La Tufa.

workshops - Gualtieri 2001). Interestingly, the study (in the course of publication) of the large quantities of Italian *terra sigillata* associated with the Augustan-Julio Claudian period shows, aside to unquestionable Arretine products, identifiable also by some of the best known stamps from those workshops, a number of locally made wares, especially for the later productions of this class of fine wares (personal communication by Dr.J.W. Hayes; also Kolonicki 2001).

A noticeable change in the second half of the first century A.D. is indicated not only by the nature of the pottery assemblages but also by a fourth group of brick-stamps dated to the last decades of the 1<sup>st</sup> c. A.D., with A.GELLI .POTNI, probably documenting a new transfer of ownership, into private hands (a freedman tied to the family of the Gelli, attested in the territory between Ossaia and Cortona by funerary inscriptions of the early imperial period) , which might be connected with the works of re-structuring documented in some parts of the central residential nucleus. Here, the rooms to the south-east of the large *atrium* show radical transformations into 'working areas' by the addition of a system of canals which cut through the previous mosaic pavements. The evidence so far available for the later 1<sup>st</sup> and 2<sup>nd</sup> centuries A.D., particularly the vast assemblage of locally produced 'Spello type' amphorae (work in progress by M. McCallum), is quite consistent with a general picture of decline of importance of the once luxurious *pars urbana* of the complex which is matched by a phenomenon of enhanced agricultural (and other ) production.

**M.G.**

## 2. CAMPANA PLAQUES: PREVIOUS STUDIES AND RELEVANCE OF AN ARCHAOMETRIC APPROACH

The definition Campana plaques indicates a class of architectural terracottas, characterized by an ornamental syntax much different from that of traditional Etrusco-Italic terracottas,

with figured and narrative motifs prevailing over geometric and flowered ones (typical of the latter).

Such reliefs were employed in public buildings, appointed to sacred or civic functions, and particularly prestigious private buildings, and they were more exclusively used than contemporary antefixes. This genre seems to flourish in Roman urban context, where most refined testimonies turn out to be direct emanation of the propaganda message adopted by the central power. Nevertheless, a progressively growing diffusion of such a production on a relatively wider scale, can be noticed both in Rome and in the suburbs, presumably in relation with phenomena of local *evergetism* and, even more with manifestations of private taste. As figured materials, Campana plaques can be associated in mythological/narrative cycles, and they open up meaningful perspectives on systems of values and forms of programmatic self-representation, both in public and private context.

The mechanisms and logic of diffusion of this class of artefacts has been a long lasting matter of debate (Anselmino, 1981; Tortorella, 1981b; Strazzulla, 1987a; Strazzulla, 1987b; for a general survey, see Torelli, 1983). The role of Rome as propelling centre of models for architectural terracottas in general, starting from 2<sup>nd</sup> cent. BC (before Campana plaques appeared), is unanimously acknowledged. Propagation of finished products can be allowed as well as diffusion of moulds or even of plain pasteboard models, worked out again on demand in local workshops, or in the *figlinae* of rustic villas for internal use only. The issue is still debated, as specific matter.

When we are faced by specimens characterized by an extremely low quality and autonomous decorative patterns as well as motifs (though inspired by Roman models), we are undoubtedly led to assume a non-urban production (Anselmino, 1981). Moreover, finding of remains of kilns – an exceptional event – with moulds and waste materials offers a decisive corroboration to the hypothesis of

local production, as in the case of Saint-Just workshop (Laubenheimer *et al.*, 1989) and in that of Bassano del Grappa workshop (Strazzulla Rusconi, 1984).

An archaeometric approach can be extremely useful, or even a determining factor, in specific cases. That is when the only opportunity for defining the productive profile of different workshops, the transmission of models from one workshop to another and, eventually, the diffusion of finished products, is based on conjectures related to considerations of historical and/or stylistic nature.

Until now, this class of materials has been analysed in conformity with many different perspectives. Description and classificatory planning out of 19<sup>th</sup> century collection catalogues, culminating with publication of the *Corpus* by H. von Rohden and H. Winnefeld (1911), was followed by new approaches to the subject (particularly during the last thirty years of 20<sup>th</sup> century). Attention focused on different specific problems, concerning mechanisms of plaque production systems (Tortorella, 1981a, b), typologic-functional aspect (Calderone, 1975) or, eventually, iconographic-stylistic and iconologic ones (particularly interesting are Borbein, 1968; Strazzulla, 1982-1983; Strazzulla, 1990). Interpretative hypotheses often complete the editing of new catalogues or university collections, and also excavation reports (most valid: Caretoni, 1973; Rizzo, 1976-1977; Di Mino, 1981; Manca Di Mores, 1982-1983; Strazzulla, 1982-1983; Strazzulla Rusconi, 1984; Ciffarelli, 1988; Laubenheimer *et al.*, 1989; Dupré and Revilla, 1991; Caravale, 1993; Strazzulla, 1990. As for museum catalogues: Mielsch, 1971; Hedinger, 1987; Perry, 1997). Nevertheless, studies on this kind of production have been only rarely matched by archaeometric analysis of constituent materials. On the other hand, archaeometric investigations on Campana plaques refer only to a few pieces and are marginal to more detailed studies on different typologies of architectural terracottas. More precisely, archaeometric tests were carried out in the following four cases. The first one is that

of a single Campana plaque from the magnificent building of the Fondo *Tuzet* in Aquileia (Strazzulla, 1982-1983, 1987a), which has been studied during a research concerning architectural terracottas of Roman Venetia. Then, two Campana plaques coming from the workshop in Via Gallia in Rome, were examined in the context of a research on antefixes from the *Antiquarium Comunale* (Anselmino, 1977). In another case, fluorescence analysis was applied to a number of amphora fragments and three Campana plaques seemingly produced in the same workshop at Saint-Just (Laubenheimer *et al.*, 1989). Finally, a test was carried out in order to specify the production technique of architectural terracottas from the Tarragona territory, which seems to have implied the application of archaeometric analysis to a single Campana plaque coming from the region (Ramos Sainz *et al.*, 1990; Vigil de la Villa *et al.*, 1994), but the results of such analysis have not been published.

In the case of Aquileia, test results prove meaningful, suggesting the hypothesis of finished products imported on the demand of a highly prestigious client, presumably the Imperial family. And there is an evident contrast with an apparently non-urban provenance of architectural terracottas from Roman Venetia of a different type (and with the hypothesis of a local production by urban craftsmen of the same terracottas from the Fondo *Tuzet* – as postulated by the author of the *Corpus* – as well).

In the case of the workshop in Via Gallia, the study of two pieces of Campana plaques indicates a characteristic fabric of urban production, as also shown by the analysis of a considerable number of urban antefixes. Compared to the Roman situation, outcomes of the analysis on a sample of an antefix from the Settefinestre villa, in the territory of Grosseto, together with macroscopic tests carried out on clay of all architectural terracottas from the villa, meaningfully reveal that all of them are locally produced, including Campana type plaques (Celuzza 1985). Different origins of

materials employed seem to correspond to already verified characteristics of the villa, which was owned by Roman élite members and entrepreneurs but, in this case, not by members of the Imperial family. This clearly shows a productive character of the complex from its very beginning – second quarter of 2<sup>nd</sup> cent. B.C. – first quarter of 1<sup>st</sup> cent. A.D. (Celuzza 1985).

Indeed the Saint Just analyses, indicate substantial degree of homogeneity between the different classes of artifacts produced at the site (Campana plaques and amphoras).

Though very selective, the examples of archaeometric analyses that have just been described, show how productive such a research can be. These cases suggest the necessity of extending archaeometric studies to the same general contexts, in order to prove hypotheses already formulated, as well as to new contexts and, eventually, to the class of materials on the whole.

### 3. ARCHAEOLOGICAL HYPOTHESES

The iconographic type testified by fragments of Campana plaques found at Cortona, represents an Siren standing on top of an acanthus tuft turned upside down, from which luxuriant flowered tendrils develop.

Another variant of the same pattern is present on known reliefs (von Rohden and Winnefeld, 1911) coming from another property of the Imperial family (the fact is not negligible), the *Horti Sallustiani* in Rome (fig. 2). Although fragmentary, the mentioned specimens from Rome are still more complete than those from Ossaia.

Yet, it must be pointed out that two considerably different versions of the same iconographic type have been traced at Ossaia. Execution levels are qualitatively different, and this immediately allows to think of two different productions. The former (fig. 3a) is marked by relief carried out in the style of the

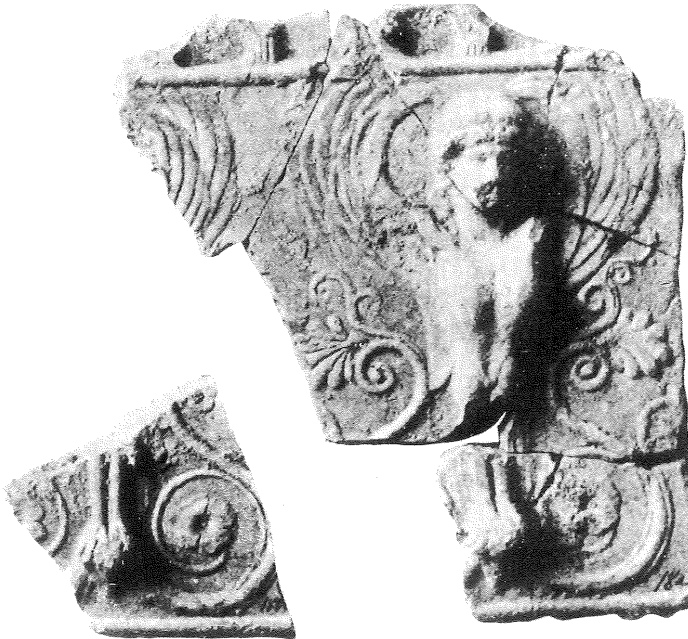


Fig. 2 – Iconographic type of fragmentary Campana plaque from the *Horti Sallustiani* (after von Rhoden and Winnefeld, 1911).

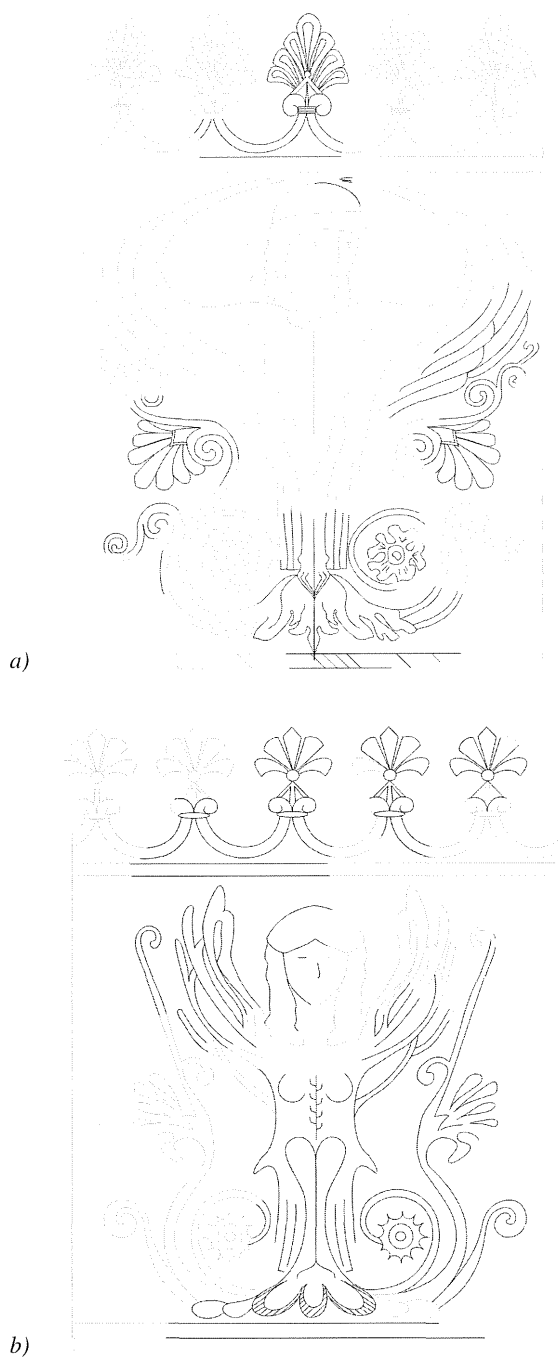


Fig. 3 – Campana plaques from the villa in Ossaia – La Tufa. Graphic reconstruction of the two different versions, in high (a) and poorer style (b), of iconographic type. Testified parts of fragments are in black, graphic integrations are in grey.

best products belonging to the Late-Republican/Early-Imperial period, quick and smooth, with delicate *chiaroscuro*. As for flowered tendrils, the modelling is instead thin, clearly outlined, from time to time heavily engraved, so that it looks like embossed metal. Motifs are finely stylized, though maintaining naturalistic quality. The latter (fig. 3b) shows a poorer style «reproduction» of the same iconographic type. Modelling appears now extremely stiff and dry, with figures outlined in a most awkward schematic way, «geometricized».

What we have just described, leads us to think that stylistically superior examples had been imported from the centre of power, presumably during the first living phase of the villa, between Late-Republican period (when it was built) and Augustan age (when it became property of the Imperial family). Also extremely meaningful is the fact that the crowning border, decorated with small arches and palmettes, recurring with similar varieties on *Aufsatzplatten*, can only be punctually compared with the «Nike killing the bull» plaque (Coarelli, 1981; Tortorella, 1981a), coming from the podium (Augustan phase) of the temple B in the sacred area of Largo Argentina. The Nike relief was clearly reused

when Agrippa started the restoration of buildings in the area, and it could date to the reworkings of the time of Pompey or Caesar. Thus, mould of such crowning border (one of the few elements allowing us to distinguish the production of different workshops) is testified in Rome since that period, and it is applied to a piece which was commissioned by one of the *magni viri* of the Late-Republican age.

According to the conclusions just drawn, it can be inferred that, in the case of the Ossaia – La Tufa villa, low quality plaques were produced by local workshops, on the occasion of the mentioned restructuring of parts of the complex during the later first century A.D., when a number of rooms were turned into productive areas.

The study of palmette antefixes, with fronds turning to the inside (Pensabene and Di Mino, 1983), only two fragments of which were found in the villa (fig. 4), goes in the same direction. Diffusion of the basic decorative pattern is connected to its usage in the buildings of the Augustan period, where pieces with such palmettes developing from an acanthus tuft were employed. The type found at Ossaia – La Tufa, though only testified by a few fragments, is comparable to few known pieces, dated to the second half of 1<sup>st</sup> cent.

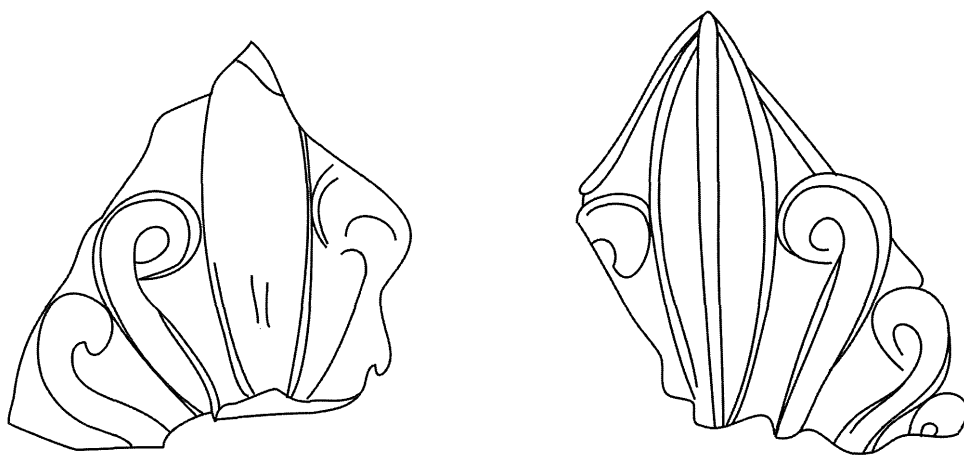


Fig. 4 –Graphic relief of antefixes from the villa at Ossaia – La Tufa.



B.C., and coming from areas that, in two cases at least, were related to restoration works made by Pompey and Augustus (fig. 5). The context of utilization adds to the significance of the comparisons just drawn, in a way similar to what we have already argued for the Campana plaques. More precisely, the type could correspond to that of antefixes traced within the Augustan complex of the Palatine (Strazzulla 1990) and on the eastern slope of the Capitoline Hill (Pensabene and Di Mino, 1983). It is noteworthy that Filippo Coarelli (1984) ascribes examples of Campana plaques coming from the Capitoline Hill to the workshop of Asinius Pollio, the same workshop that hypothetically produced the Palatine plaques as well. Otherwise, the type of antefixes could be the same as that testified in the sacred area of Largo Argentina (Anselmino, 1977). Once again, the latest circumstance is worthy of particular attention: as we have already explained, fragments of Campana plaques with identical crowning border as that of pieces from Cortona come from the same area.

Of course, it is impossible to establish if also antefixes of higher quality were employed in the villa of Ossaia-La Tufa (as for the plaques, the hypothesis is that they were imported from Rome). As a matter of fact, examples found are indeed comparable to plaques of the lowest quality, because of execution level and macroscopic aspect of the impasto.

#### 4. FORMULATION OF THE ARCHAEO-METRIC RESEARCH

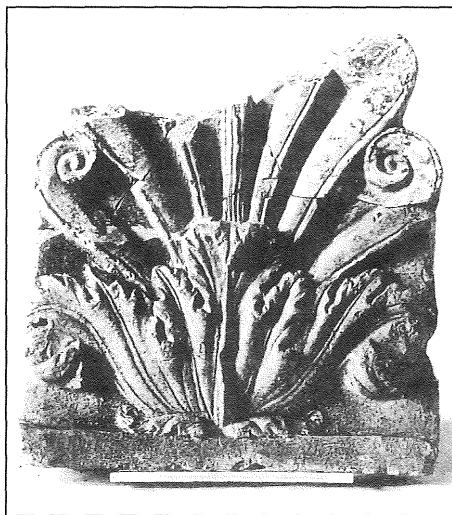
The hypothesis formulated according to this first test of fragments can find confirmation through archaeometric study. First of all, the fact that the different execution levels seem to correspond, even at an absolutely superficial observation, to two different types of clay strongly stimulates prosecution of such a research.

Study of materials coming from a specific site begins with the creation of a typology for

whatever class of ceramics. This, in order to establish connection between findspots and the class on the whole, even when there is no interest in a successive archaeometric test. As for Campana plaques *tout-court*, and consequently pieces from Ossaia, a typology can not be created. Better, there is no sense in drawing comparisons in conformity with a morphologic classification. Obviously, different functional types of architectural terracottas - revetment plaques, pierced cresting plaques, *Aufsatzplatten* and *simas* -, according to different functions, don't at all testify different productive groups. Only identical crowning border and, logically, correspondence of moulds, allows recognition of production of a workshop or connections between different ones. Extensively, the concept of «typology» must not be applied to the bearing, but to crowning borders, iconographic types and, eventually, to the style of reliefs.

As we have already seen, two groups of fragments of Campana plaques from Ossaia-La Tufa were traced on the basis of such considerations.

When applying criteria normally used for tests of ceramic classes (Cuomo Di Caprio, 1985; Olcese, 1993a, b; Olcese Hiener, 1993; Olcese, 1996; Olcese and Picon, 1995; Murialdo *et al.*, 1998; Olcese, 2000) to such class of material – which would be better assimilated to classes of products of less refined impasto, such as bricks and containers –, we can confirm that groups seem to differ as regards to the two productive phases. The former, called «supply phase», shows that impastos are different, while conclusions emerging from the latter, called «conversion phase» (Giannichedda, 2000), allow us to point out differences involving the making of the mould, which was nevertheless used in both cases. Anyway, while mould of one group was very accurately made, we can postulate that the other one was coarsely modelled, very likely on the basis of an approximate casting of the best examples, as shown by narrowing of the moulded relief.



(after Strazzalla 1990)



(after Anselmino 1977)



(after Pensabene and Di Mino 1983)

Fig. 5 – Urban reference models of antefixes of the palmettes type from Palatine, Largo Argentina and Capitol.

The first necessary step we have to take in case we want to determine the origin of the pieces, is that of comparing compositional characteristics of materials we are testing with those of a «reference group» (Olcese Hiener, 1993).

In our case, we assumed that some of the reliefs were made in Rome, and this is the area where we must look for reference material. As main collections of Campana plaques were temporarily inaccessible at the time of sampling (those of the Roman National Museum and those of the Capitoline Museums), the one «reference group» we could create is that of plaques from the Palatine Museum. Actually, they represent a production of a most certain origin, as they were attributed to the Augustan building called *Portico of the Danaids* and set in a precise historical context, between 36-26 BC (Carettoni, 1973).

**G.R.**

#### 5. SAMPLING AND METHODS OF ANALYSIS

It seemed sufficient to examine two samples of pieces of refined workmanship and two samples of those remaining, because of exiguous number and small dimension of fragments from Cortona, which were all classified at macroscopic level with the aid of a lens. Samples of urban production were chosen according to the attempt of collecting a representative number of cases, «assaying» products made with impastos coloured with scarcely different nuances and bearing reliefs both iconographically and stylistically heterogeneous, which cannot be surely ascribed to a particular cultural context, or at least to an identical context of employment, though they belong to the same architectural complex. In this respect, samples were chosen representing mythological-narrative motifs (samples P5, P7, P8 and P10; tab. 1), well in accordance with Augustan suggestions, along with iconographies referring to Egyptian cult (samples P6 and P9; tab. 1), not properly adequate symbols for semi-public rooms at the

time of employment (the age immediately after the battle of Actium).

A list of the samples with inventory numbers and macroscopic characteristics is reported in table 1.

The samples, consisting of small chips of material, were observed first at the stereoscopic microscope and then cut and prepared to obtain polished thin sections. The thin sections were observed using a polarizing microscope to attain textural characterization of the fabrics, and then analyzed by scanning electron microscopy coupled with EDS microanalysis (SEM-EDS) to characterize significant phases present within the fabrics. SEM-EDS microanalysis was performed at 15KV beam current for a 60'' count time.

**G.R.; B.M.**

#### 6. MACROSCOPIC CHARACTERISTICS

Samples in different styles from Ossaia – La Tufa show very distinguishing macroscopic features. In fact, the samples in high style (LT1 and LT2) are pink, show irregular fracturing and are characterized by the presence of magmatic inclusions consisting of pyroclastic fragments, biotite and, in one case, pyroxene. The samples in low style (LT3 and LT4) have a peculiar reddish colour, show earthy fracturing and are characterized by the presence of abundant silicoclastic inclusions consisting of quartz, lithic fragments and, in one case, feldspar. They do not contain any kind of magmatic inclusion. The different mode of fracturing in the two groups of samples could be the consequence of different amounts of clay fraction within the pastes, namely to higher amounts of clay in the earthy irregularly fractured samples (LT3 and LT4) and lower amounts in the irregularly fractured samples (LT1 and LT2).

The samples from Palatino Museum are all characterized by a noticeable presence of magmatic inclusions, mainly pyroclastic fragments but also pyroxene in one of the samples. The pyroclastic fragments are often

TABLE I  
*Summary of macroscopic characteristics of the samples.*

Label	Inventory #	Colour <sup>§</sup>	Fracture	Inclusions	Notes
LT1	99048	7.5YR 7/4: pink	irregular	Bi, Pyr, Px	-
LT2	97149	5YR 7/3: pink	irregular	Bi, Pyr	Oriented pores; laminated appearance
LT3	99061	5YR 5/8: yellowish red	earthy irregular	Qz, LF	-
LT4	97247	5YR 5/8: yellowish red	earthy irregular	Qz, Fld, LF	-
P5	380037	7.5YR 7/4: pink	flaky	Qz, Pyr, OM	-
P6	379625	7.5YR 7/4: pink	irregular	Qz, Pyr, Px	-
P7	379651	7.5YR 8/4: pink	irregular	Pyr	-
P8	380077	10YR 8/4: very pale brown	rough irregular	Qz, Pyr, OM	-
P9	380014	5YR 7/3: pink	indented	Pyr	-
P10	379629	7.5YR 8/4: pink	irregular	Pyr, OM	Laminated appearance

\* reported following the criteria by Olcese (1993a).

§ defined by comparison with the Munsell Soil Color Chart.

Abbreviations: Bi = biotite; Fld = feldspar; Px = pyroxene; Pyr = pyroclastic fragment; Qz = quartz; LF = lithoclastic fragment; OM = organic matter traces

millimetric or sub-millimetric in size. Quartz is present in three of the samples, with smaller dimensions with respect to the pyroclastic fragments. Three of the samples are also characterized by the presence of blackish moulds which have been attributed to organic matter residues. The colour is pink in all the samples but one, and the grain size of the paste, deducible by the mode of fracturing, is relatively finer in sample P5, and relatively coarser in samples P8 and P9 with respect to the rest of the samples.

Two of the samples - one from Ossaia – La Tufa and one from Palatino Museum - are characterized by the presence of oriented pores and/or show a laminated appearance in the fractured surfaces. These characteristics can be both related to the manufacturing process of architectural terracotta, in which the clay matrix is stretched and then pressed within a mould to obtain the decorative relief (Cuomo Di Caprio, 1985).

## 7. PETROGRAPHY AND MINERAL CHEMISTRY

The petrofabric characteristics of the samples are described in table 2, and showed in figure 6. The matrix is pale brown to ochre and orange in the samples from Ossaia – La Tufa in high and low style, respectively, and pale brown to ochre in the samples from Palatino Museum. Total porosity is 3 and 5% in the samples from Ossaia – La Tufa, and 2 and 5% in the samples from Palatino Museum, whereas the mean size of the pores is about 300µm in the formers, and 100 to 700µm in the latters.

The minerals and phases recognized at the microscope are quartz, feldspar, clinopyroxene, phyllosilicates and pyroclastic fragments. Quartz is subhedral to anhedral, sub-spherical, angular to sub-angular in shape (after Krumbein and Sloss, 1979). In the samples in low style from Ossaia – La Tufa (samples LT3 and LT4) it frequently forms polycrystalline aggregates (fig. 6c, d). The quartz abundance is 2 and 7% in the samples in high style, 20 and 25% in the samples poorer in style, and 1 to 3%

in the samples from Palatino Museum. The size of crystals is from 20 to 210µm in the samples in high style, from 10 to 300µm in the samples in poorer style, both from Ossaia – La Tufa, and from 10 to 400µm in the samples from Palatino Museum.

Feldspar is mostly K-feldspar but a few plagioclase is also present in some of the samples from Palatino Museum. Unfortunately, it was not possible to define exactly the composition of all the feldspars due to the small size of some of the grains, typically ranging from 10 to 60µm. The amount of feldspar is a bit higher in the samples from Ossaia – La Tufa than in those from Palatino Museum.

Clinopyroxenes were found only in samples LT1 and P6. In sample LT1 the clinopyroxene is loose within the matrix, whereas in sample P6 it is embedded in a pyroclastic fragment (fig. 6a, f). The shape is subhedral and fragmented, the mean size is 350µm in the sample from Ossaia - La Tufa and 500µm in the sample from Palatino Museum, the composition is salitic in both cases (tab. 3).

Phyllosilicates, present in all the samples with similar amounts, have been mostly ascribed to white mica and biotite, but in some cases the small size of the grains (ranging from 20 to 100µm) and the vivid colour of matrix made it difficult to discriminate and to analyze these minerals. For this reason the term «phyllosilicate» was preferred to the term «mica» to describe the typology of minerals as a whole. A large biotite crystal embedded in a pyroclastic fragment is present in one of the samples from Palatino Museum (sample P7; fig. 6g). The composition of this mineral is reported in table 3.

Pyroclastic fragments are present in all the samples except in those in low style from Ossaia – La Tufa (samples LT3 and LT4). The amount of pyroclastic fragments is 2 and 3% in the samples from Ossaia - La Tufa, 3 and 7% in the samples from Palatino Museum, whereas the size of the fragments is from 100µm to 1.3mm in the samples from Ossaia – La Tufa, and from 100µm to 2.7mm in the samples from

TABLE 2  
*Summary of the petrography of the samples from Ossaia – La Tufa (LT) and Palatino Museum (P).*

MATRIX				GRAINS													
Label	Colour*	P** (%)	P <sub>size</sub> <sup>#</sup> (µm)	Abund. /Shape of pores	So <sup>§</sup>	Size <sub>range</sub> (µm)	Size <sub>mean</sub> (µm)	Pyr (%)	Pyr <sub>range</sub> (µm)	Qz (%)	Qz <sub>range</sub> (µm)	Fld (%)	Fld <sub>range</sub> (µm)	Phyl (%)	Phyl <sub>range</sub> (µm)	CPX (%)	CPX <sub>mean</sub> (µm)
LT1	pale brown	3	350	few; large	M/L	30-350	150	2	100-400	7	40-210	2	30-50	<2	30-80	<1	350
LT2	ochre	3	250	many; small	M/H	20-1300	50	3	100-1300	2	20-70	<1	20-30	<3	40-60	-	-
LT3	orange	5	300	large; irregular	L	10-300	120	-	-	20	30-300	1	50-60	<2	20-60	-	-
LT4	orange	5	300	large; rounded	L	10-250	120	-	-	25	10-250	1	30-40	<2	20-50	-	-
P5	ochre	5	700	rounded	M/H	30-1100	50	5	170-1100	2	50-400	<1	30-40	<2	20-40	-	-
P6	ochre	3	250	closed; irregular	M	30-2000	200	7	170-2700	2	30-150	<1	30-40	2	40-100	<1	500
P7	ochre	3	400	fissures	H	10-1800	50	5	400-2000	1	20-70	<1	10-30	<2	40-60	-	-
P8	pale brown	3	200	many; small	M/H	10-350	50	3	100-350	2	10-90	<1	20-30	<2	20-40	-	-
P9	pale brown	5	200	many; small	M/H	10-2500	200	5	100-2500	3	20-150	<1	20-30	<2	20-40	-	-
P10	ochre	2	100	small; closed	M/H	20-650	50	5	200-650	2	20-50	<1	30-40	<2	20-40	-	-

\* parallel nicol view

\*\* total porosity

# mean pore size

§ Sorting: L = low; M = medium; H = high

Data of total porosity and relative abundance of grains have been obtained by visual estimate (Shvetsov diagrams) at 40x and 100x magnification.

Mean pore size has been estimated by direct measurement of the mean diameter of pores.

Abbreviations: Pyr = pyroclastic fragments; Qz = quartz; Fld = feldspar; Phyl = phyllosilicates; CPX = clinopyroxene

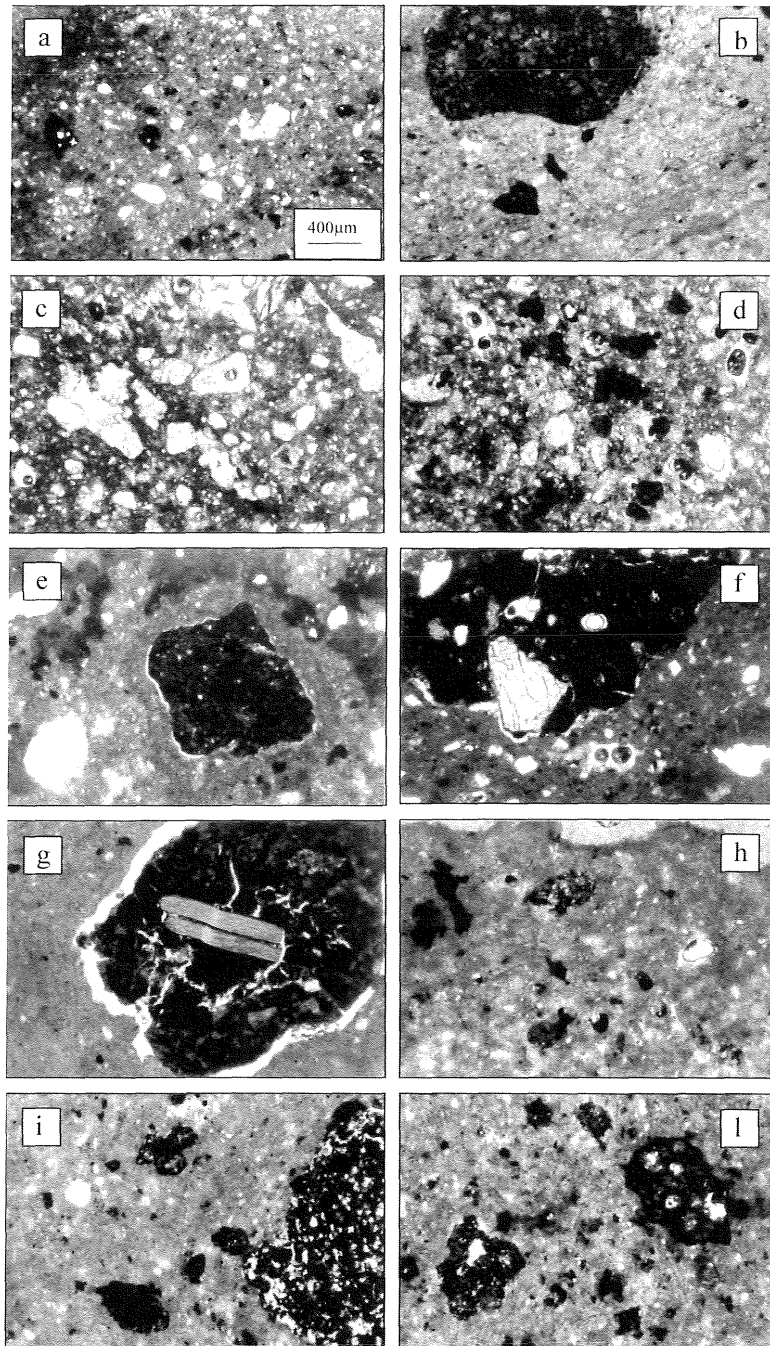


Fig. 6 – Petrofabric characteristics of the samples: LT1 (a), LT2 (b), LT3 (c), LT4 (d), P1 (e), P2 (f), P3 (g), P4 (h), P5 (i) and P6 (l). Optical photomicrographs, parallel nicols, 40x magnification.

TABLE 3

*Representative chemical analyses of pyroclastic fragments (pf), pyroxenes (px), spinels (sp) and biotite (bi) from Ossaia – La Tufa (LT) and Palatino Museum (P).*

	LT1-pf1	LT1-pf2	LT1-px	P6-pf1	P6-pf2	P6-px	P6-sp	P7-pf1	P7-pf2	P7-bi	P9-pf1	P9-pf2	P10-pf1	P10-pf2
SiO <sub>2</sub>	54.30	51.55	49.21	53.09	51.81	47.76	3.70	50.74	56.93	40.19	50.72	54.98	56.83	58.04
TiO <sub>2</sub>			0.62	1.04		1.09	12.06	1.05	0.63	3.10	1.50	0.26	0.42	0.39
Al <sub>2</sub> O <sub>3</sub>	17.64	18.23	5.49	21.49	14.72	5.60	2.90	14.95	22.02	20.05	18.04	20.39	21.90	3.71
Cr <sub>2</sub> O <sub>3</sub>			0.32			0.43								
FeO <sub>tot</sub>	5.17	10.37	6.21	10.91	4.77	6.44	79.06	10.77	4.25	9.28	10.80	4.39	4.44	5.29
MnO							1.16							
MgO	3.37	3.45	12.72	2.25	2.21	13.12		4.31	3.55	19.18	6.91	3.60	3.39	13.23
CaO	16.12	9.02	25.42	6.77	25.50	25.56	1.12	12.62	5.51		6.21	14.89	6.69	19.33
Na <sub>2</sub> O	1.83	1.88		3.31				1.61	4.09		2.31	0.37	4.50	
K <sub>2</sub> O	1.56	5.49		1.12	0.98			3.94	3.02	8.20	3.52	1.13	1.82	

\* Point analyses performed in different positions within the phases. Data representative of groups of analyses for each phase.



Palatino Museum. The pyroclastic fragments are generally rounded in shape and characterized by remarkable vesicular porosity which is particularly evident in samples P5 and P6. Small spinel grains (tab. 3) have been found within one of the pyroclastic fragments in sample P6.

The chemical composition of pyroclastic fragments is mildly alkaline with K/Na approximating unity, two different K/Ca ratios and corresponding Fe amounts, high aluminium and low titanium (tab. 3). It is comparable to that of rocks belonging to the Potassium Series (Peccerillo and Manetti, 1985).

Comparison between the samples in high and low style from Ossaia – La Tufa reveals significant differences between them. In fact, the samples in low style do not contain magmatic phases, are very enriched in quartz and show lower sorting of grains. On the other hand, samples from Palatino Museum show a wide range of fabric characteristics as for the size and amount of phases, resulting in medium to high sorting of grains within the matrix.

#### 8. DISCUSSION OF ARCHAEOMETRIC RESULTS

The results point to the existence of two different kinds of paste in the terracotta from Ossaia – La Tufa, corresponding to different degrees of stylistic refinement. In fact, the samples in high style (LT1 and LT2) are characterized by the presence of a magmatic component mainly consisting of pyroclastic fragments, whereas the samples in low style (LT3 and LT4) do not show any kind of magmatic phase and are characterized by a great abundance of quartz. These observations point to different provenance of the materials employed in the preparation of the different kinds of paste.

In the samples in high style, the chemical and mineralogical characteristics of volcanic clasts and, particularly, the salitic composition of clinopyroxene are consistent with the volcanic units of the Roman Comagmatic

Province. The Roman Comagmatic Province is one of the best known occurrences of potassic alkaline volcanism. It consists of a series of volcanic centres located along the Tyrrhenian border of the Apennines, from South Tuscany, through Latium to the Naples area, with prevailing pyroclastic products and subordinate lava flows (Peccerillo and Manetti, 1985). The age of volcanic activity is 0.8 (Vulsini Mountains) to 0.03Ma (till present; Somma-Vesuvius) (Barberi and Innocenti, 1967; Nicoletti, 1969; Fornaseri, 1985). Based on petrological characteristics, two main series have been distinguished within the Roman Comagmatic Province: a High-potassium Series (HKS) and a Potassium Series (KS) (Appleton, 1972). The KS include slightly undersaturated to saturated rocks (alkalibasalts, trachybasalts, latites and trachytes) with lower  $K_2O$  and  $K_2O/Na_2O$  ratios than the HKS rocks which, on turn, consist of strongly undersaturated rocks (leucitites, leucite tephrites, leucite tephritic phonolites and leucite phonolites).

The chemical composition of pyroclastic fragments, particularly the  $K_2O/Na_2O$  ratio, and the lack of leucite in the samples in high style from Ossaia – La Tufa is in better accordance with KS than with HKS, therefore a provenance from KS can be postulated. This hypothesis leads to restrict the area of provenance of raw materials to the Vulsini, Sabatini, Ernici, Roccamonfina, Phlegrean Fields and Somma-Vesuvius districts, where KS rocks outcrop alone or together with HKS. Moreover, the exclusive presence of pyroclastic over lava fragments, and the chemical composition of these fragments point to a provenance from the Phlegrean Fields where pyroclastics of composition compatible with that of the analyzed samples largely predominate over lavas (Peccerillo, personal communication).

In the samples in low style from Ossaia – La Tufa, the characteristics of quartz are consistent with those of sediments belonging to the Macigno formation. Macigno is a quartz-feldspar-micaceous Oligo-Miocene turbiditic

complex with silty marls and clays and limy-marly, calcarenitic interbedded layers (Jacobacci *et al.*, 1970). The size, sorting and abundance of quartz, and the remarkable presence of quartz aggregates with cataclastic structure have been considered peculiar features of Macigno sediments distinguishing them from Marnoso Arenacea sediments (Cipriani, 1961; Cipriani and Malesani, 1963a, b). In particular, the presence of quartz polycrystalline aggregates with cataclastic structure has been put into relation with a different origin of quartz – from metamorphic and magmatic rocks, respectively – in Macigno and Marnoso Arenacea formations (Cipriani and Malesani, 1963b). The roundness and cloudiness of the larger quartz grains is an evidence of transport within an alluvial basin, whereas the subhedral and anhedral small grains probably derive from mechanical fragmentation of the polycrystalline aggregates during transport. This points to a provenance of raw material from Cortona surroundings, where sandy sediments of eluvial origin in river-lacustrine facies widely outcrop in the plain.

Samples from Palatino Museum, though quite different one from each other, are all to be ascribed to the same volcanic Districts as the samples in high style from Ossaia – La Tufa. In fact, they are all characterized by the presence of pyroclastic fragments, and, in one of the fragments (sample P6), salitic clinopyroxene and magnetite grains are also present. This is in good accordance with a local provenance, from Urban Roman context, originally postulated for this reference group of samples.

The mutual differences among the samples from Palatino Museum are difficult to be interpreted. They may be the consequence of differences in the intrinsic composition of raw material, that is different provenances of raw material, or the consequence of different preparation of the paste from raw material, that is different workshops and/or modes of preparation within the same workshop. In the first case pyroclastic grains were already present within the raw material and did not

suffer severe purification at the workshop. In the second case pyroclastic grains were intentionally added to the matrix to obtain the pastes. Detailed bulk chemical analysis of pastes and raw materials would be necessary to try to solve this question, however, by analogy with other similar occurrences (Cuomo Di Caprio, 1985), the second case is the most likely hypothesis.

Comparison between samples in high style from Ossaia – La Tufa and samples from Palatino Museum reveals some analogies and significant similarities. In particular, sample LT1 shows petrofabric analogies (similar sorting of grains within the matrix) to sample P6, and geochemical affinities (similar composition of pyroclastic fragments) to sample P9, whereas sample LT2 shows clear similarities in sorting, abundance and size range of grains to samples P8 and P9. If a large quantity of data representative of contemporary Urban productions from different attested workshops is available, these observations will be helpful for a correct assessment of provenance.

**B.M.**

## 9. CONCLUDING REMARKS

Archaeometric characterization of samples of Campana plaques from Ossaia – La Tufa points to the existence of two different groups of production, local and urban, of architectural terracottas, corresponding to very different stylistic levels. Local production, in ‘low’ style, is characterized by the sole presence of a sedimentary fraction which has been attributed to local geological formations outcropping in the Cortona surroundings. Urban production, in ‘high’ style, is characterized by the presence of a volcanic component which has been attributed to pyroclastic potassium alkaline magmatic rocks outcropping in Latium and Campania. According to Cuomo Di Caprio (1985), importation of raw material was a far less common practice than importation of products in antiquity, therefore urban

production is to be intended as imported material coming from the centre of power. In the light of these points, the results are interpreted as follows.

In the period in which the villa in Ossaia – La Tufa probably passed into imperial property, some products of good workmanship were imported from Rome to Ossaia. These products are similar to the products from the Palatine manufactured on commission by Augustus, and show the same iconographic type present at *Horti Sallustiani*, another imperial property previously belonging to Caesar and, then, to Sallustius. It is possible that the restricted *entourage* gravitating around the centre of power imported into the new property high craftsmanship products with more elaborate figurative projects, the same projects which were already present in public and private buildings in Rome belonging to the same authority, for propaganda and self-representation purposes. Similar conclusions were obtained by Strazzulla (1987a) from the analysis of a single terracotta sample from a villa in Aquileia, probably one of the residences of emperor Tiberius. In a subsequent period of decline occurring in the Flavian age, local products of inferior quality appeared in the decorative reliefs of the villa.

The presence of terracotta reliefs of very different stylistical quality, and similar archaeological interpretation, has been documented in other occurrences such as the villa of Voconius Pollio in Marino (Rizzo, 1976-77). In this case a large quantity of fine quality terracotta sherds, along with a small quantity of bad quality pieces reproducing the same iconographical elements in declining and 'poorer' style, were found. The former were interpreted as products of urban manufacture, whereas the latter were considered the results of local reproduction. Considering the historical significance of these findings, this is of particular importance for an extension of research to the whole class of architectural terracottas.

The preliminary results of this investigation are so promising as to encourage future

development of research with the acquisition of new analytical data on a larger number of samples from Ossaia and from Rome representative of different typologies and varieties within the same typological class. Petrographic investigation is to be implemented by quantitative fabric analysis of textures after digital treatment of thin section images. On the other hand, bulk quantitative chemical and mineralogical data by X-ray fluorescence and X-ray diffractometry are necessary to clarify the relationships between the products and the source areas of raw materials. This kind of investigation is now in progress on a new collection of twenty samples of Campana Plaques from the Roman National Museum, now in deposit in the caveau of Palazzo Massimo in Rome. Moreover, sampling in Ossaia is going to be extended to kiln discards found within the perimeter of the ancient property (Fracchia and Gualtieri, in press), whereas geological investigation of the possible sites of provenance of raw materials has already started.

**B.M.; G.R.**

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