

## DISCUSSION AND CONCLUSIONS

The main objective for undertaking this study was to determine if it would be possible to establish a relative chronology for decoration plasters valid from the archaic period to the last days of Pompeii. A second motif was to understand if plaster analyses could be used as a complementary tool for the dating of decoration layers even when the paintings have vanished. In that case, a reference system would be needed to make it possible to use the method for research in any building over the site. In addition, it would also be interesting to know if the quality of craftsmanship was linked to a period in time or to workshops, and if the plasters' quality or the plastering technique has had importance for the preservation of decorations, knowledge that might be used for choice of conservation substances and for the preservation of excavated wall paintings. The questions posed will be treated in the order presented above. Problems connected with method and the identification of samples will be discussed and, finally, some suggestions on how to plan and use plaster investigations, followed by the conclusions.

Most houses in this investigation are traditional *atrium* houses built in the period between the 2<sup>nd</sup> and the 1<sup>st</sup> centuries B.C, some even earlier. Some houses have intact structures of *opus quadratum* and *opus africanum* and all have been rebuilt in later periods, as exposed on walls in the different materials and techniques that were used. Houses in *Regio VI* and *VII* have been excavated to the level of earlier construction periods, revealing walls of the so called *protocase*, modest sized buildings with gardens of which there are substantial traces below the standing structures visible today. Remains of older buildings have been found at excavations of 3<sup>rd</sup> century destruction levels underneath the Temple of Venus too. Early structures in these areas are generally dated to the 4<sup>th</sup> and 3<sup>rd</sup> centuries BC.

The houses in which sampling has been made are large or medium size private dwellings, some of which have been enlarged while other remained relatively unchanged through centuries. Connected to most houses are workshops, bars or other commercial spaces. A few minor houses with workshops have been sampled as well. Therefore, large and significant houses, modest ones and workshops are included in the study, providing a spectrum of environments and material of different qualities. Missing in the present study are important public buildings such as those around the Forum, buildings that were part of my previous study. These buildings and the beautifully decorated houses in *insula I 9*, are registered in the separate database.

The first questions to be answered were: Is it possible to establish a correlation between a specific type of plaster and a specific period in time? Is a link between typology and chronology valid within a single house or applicable to houses within the area of Pompeii?

The first answer is yes, there is evidence plaster types are linked to specific periods in time. It would, however, be a mistake to believe there is an absolute date for when one kind of plaster was invented and when it was out of date: it is not possible to ascribe a plaster type to one year and to exclude it from the next. Most probably there were some progressive persons who were the first to adopt a new style while others preferred what they were accustomed to. Therefore the painter chosen for an innovative decoration might work on the same kind of plaster as contemporaneously used for traditional painting next door. A similar condition is reasonable to assume in a plasterers' or painters' workshop; the plastering technique might be developed or changed while the available components of the plaster were used until the supply was finished, independently on style in vogue. Keeping such 'grey zones' in mind, the results regarding plasters, phases and styles will be discussed. Dating is approximate, and in all cases based on archaeological or art historical interpretations or evidence.

### Plasters, phases and styles

In 2005 some odd plasters turned up at early structures below the Temple of Venus, in Casa del Centauro and Casa del Granduca Michele. They were not identical, but seemed to represent phases prior to the refined plasters that are distinctive of the First style. The plasters were of good quality but grey, beige or brown, which made me think it might be inclusions of earth or clay in the lime. Laboratory analyses have shown the dark appearance was generally not due to the presence of clay or earth, but caused by a large amount of very small size particles in the filler. Laboratory analyses confirm these plasters belong to a separate group. Since the plasters are found at levels chronologically earlier than the First style, another group of plasters has been added, group 0, after Brun's definition of *stile zero*. At the end of the previous research period, there were indications of two kinds of plasters in group A, and that these might be chronologically related. The present study has shown the group can be divided into subgroups Aa and Ab.

Plasters used for Style Zero and First style decoration can be divided into three different groups; 0, A and B. Group 0 contains plasters of the earliest period, *stile zero*, group A contains plasters of the First style and group B plasters related to the late First and the early Second style. There is a clear difference between these groups, which appear in chronological order and therefore represent periods in time. The characteristics are as follows:

Group 0 contains plasters that are dark. The plaster is not dirty from soil, but its dark colour - brown, beige or beige-grey - depends on the many very small size components in the filler. Only occasionally there are inclusions of minor amounts of clay, mixed into the plaster. Plasters in group 0 have been identified at the earliest levels in houses in region VI and VII, at 3<sup>rd</sup> century destruction levels below the Temple of Venus and at fragments of wall paintings such as the fragment with a painted wave pattern, *a onda*, found during excavation of Casa del Centauro.

Group A contains plasters used for First style decoration. The plasters have a “black and white” appearance, due to the many black particles and the white lime, with few and small if any lime lumps. The filler of predominantly small grains contains a lot of crystals. Main part of the particles is black, fragments of volcanic rock and pyroxenes. Group A has been divided into sub-groups Aa and Ab. The main difference is the filler, which in group Aa is composed of rounded and irregular black grains, more brown particles, and a larger amount of coloured crystals than found in subgroup Ab, in which the filler almost exclusively consists of angular and irregular black particles, many of which are long, black, broken crystals. The average grain size of Ab is larger, due to the minor quantity of very small particles and the addition of a few grains of larger size. Both plasters are well mixed and of a high quality, mostly still hard. Stucco layers often have a thickness around 3-5 mm and occasionally, in important spaces, 7-8 mm.

There is a relation between plasters in group 0, Aa and Ab. All have small grains and are carefully made. There are few signs of shrinkage. Plasters in group 0 are dark because of the great amount of very small particles. Plasters in group Aa have a similar kind of filler but not the microscopic particles that make the plaster look dark. Therefore, a “dirty” sample of group Aa may resemble a clean one in group 0. On the other hand, if a sample in group Aa has many broken black crystals it might resemble those in group Ab. There is no similarity between plasters in group 0 and Ab. As a principle, there are distinctive groups of early plasters with clear characteristics that make possible a designation to one of the groups mentioned above. In case there is some doubt archaeological, chronological, or stylistic aspects may offer information that finally places the plaster into a group.

Group B contains plasters that belong to the later phase of the First style and the early Second style as well. This kind of plaster has filler with large grains and a serious lack of small ones, a composition that often leads to fissures and voids, or “airbags”, thereby making the plaster frail. It is a “black and white” plaster too, with many black, grey and pale grey particles, but, contrary to the earlier plasters, very few crystals. In general there is no problem to recognize a plaster of group B; the many large grains are indicative.

Group C contains plasters used for Second style decoration. The plaster has filler of very small grains and a few of medium size. It has many brown particles that give a warm impression, and the lime is clean, white or slightly beige with few if any lime lumps. These plasters are well composed and of high quality. Although they might slightly resemble other small-grained plasters such as group Aa, D, and F, the ones in group C cannot, at closer inspection, be confused with other plaster types.

Group D contains a particular, very fine-grained plaster of which the filler mainly consists of crystals and few grains of volcanic material in only little lime, a combination which makes the plaster look very dark. It is not a common plaster type, in fact, this kind of plaster has only

been found in a few cases. It only resembles some top layers that sometimes occur at decorations in prominent buildings, in which the main component is crystalline but then the percentage of lime is high, which gives quite a different impression. There is no possibility to confound plasters in group D with any other plaster.

Group E contains plasters used for Third style decoration in many private houses and public buildings investigated. This is, together with group B, the only group with large-grained filler and, due to the lack of small grains the samples often present fissures and voids or “airbags”. The lime is generally clean and white, often with relatively large lime lumps. The filler is composed of grains of a great variety of colours such as black, grey, beige, brown, ochre, some of which are very large and shaped as beans. There are few crystals. A sample might be not representative because there are few bright grains or if the layer is weathered and grains have fallen. In such a case the plaster may resemble group B and E as well. In such a case, the question is generally solved by a second sample that may contain particles of the missing type.

Group F contains plasters used for Third and early Fourth style decoration. It is composed of filler with many colours and lots of crystals mixed into clean white lime which often has few small lime lumps. This kaleidoscopic plaster often is of very good quality. It has a combination of large and small grains, which together with the many crystals separates it from plasters in group E.

Group G contains plasters used for Fourth style decoration. These are dark plasters which receive their colour of the many very small grains of angular shape and often reused materials. Plasters of this kind are well composed with large and small grains but there are many lime lumps as well, which makes it of inferior quality. If there is a stucco layer it is generally thin and often contains *cocciopesto*.

Group H contains plasters used for repairs after the earthquake in AD 62. These plasters contain reused materials of many kinds such as crushed plasters, glass, ceramics and marble, mixed into quite a lot of lime that contains lime lumps which are often large. The components of these plaster types vary due to the components in the reused plaster, which might be “black and white” or many-coloured, but the low quality is always recognizable.

Finally there is group X, into which any other kind of sampled material, such as *cocciopesto*, mortar, and *opus graecanicum*, have been placed.

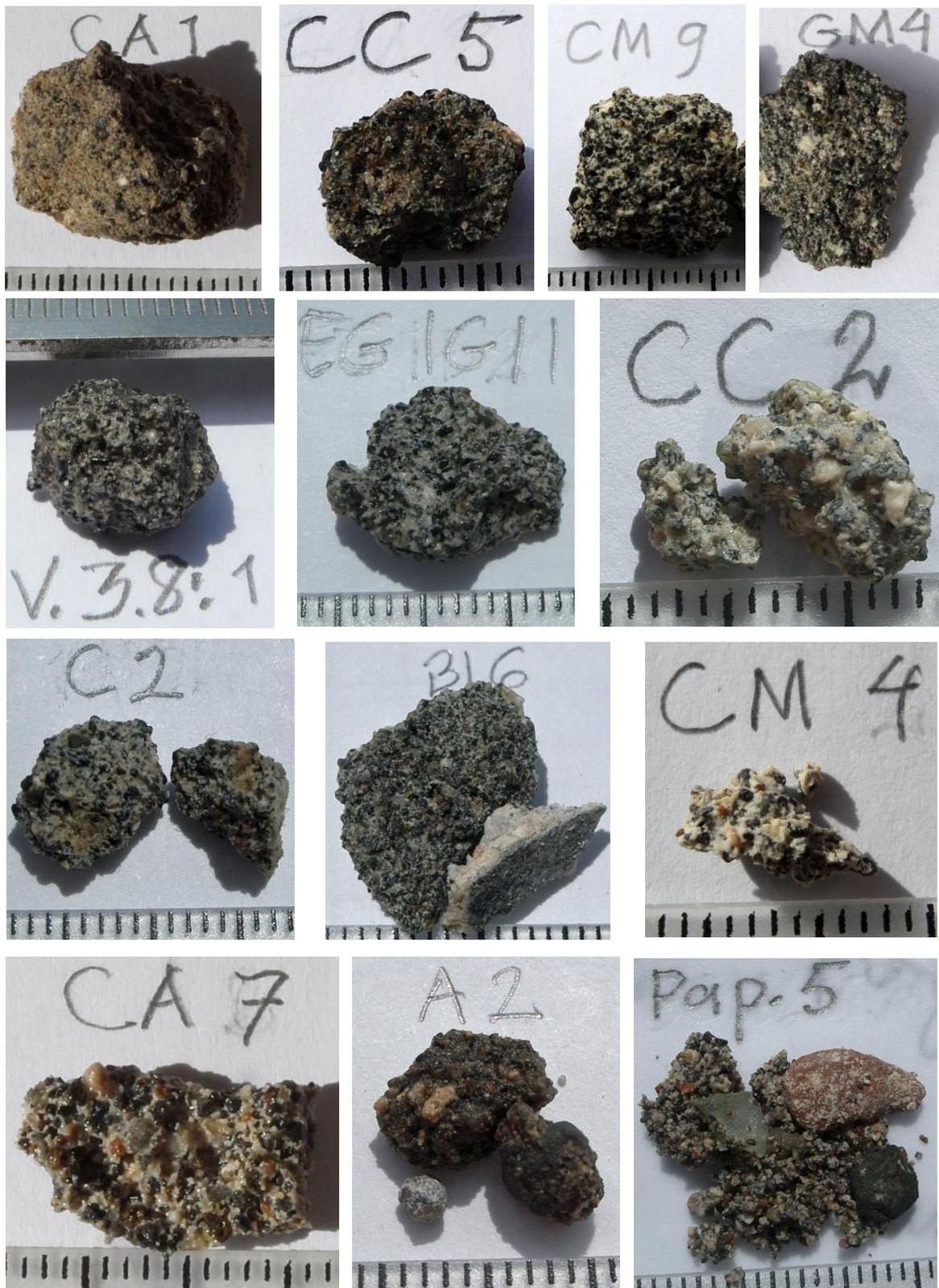


Fig.60. Plaster groups/types.

Top line: Group 0: CA1, CC5. Group Aa: CM9, GM4.

Second line: Group Ab: V 3, 8, EG 1G11. Group B: CC2.

Third line: Group C: C2. Group D: B16. Group E: CM4.

Bottom line: Group F: CA7. Group G: A2. Group H: Pap 5.

Group	House/building	Identified decoration motif	Period
0	Casa del Centauro Casa delle Amazzoni Casa di Caecilius Lucundus	Wave Red socle	End of 4th c. BC  Earliest wall structure
A (Aa)	Casa del Granduca Michele Casa del Marinaio  Casa degli Epigrammi Greci Temple of Venus, below	1st style 1st style	c. 300 BC late 3rd-early 2nd century BC earliest phase 3rd century BC
A (Ab)	Casa del Granduca Michele Casa del Centauro Casa del Frutteto Casa di Amarantus	1st style 1st style  1st style	c. 250BC end of 3rd c. BC 2nd century BC 2nd century BC
B	Casa del Centauro Casa degli Epigrammi greci Casa del Bell'Impluvio Basilica, redecoration Casa di Cerere	1st style  1st style 1st style 2nd style	2nd century BC c.120 BC c.120 BC c. 120 BC c. 120 BC
C	Casa degli Epigrammi Greci Casa del Torello Casa di Cerere Casa del Bell'Impluvio Temple of Jupiter	2nd style 2nd style 2nd style 2nd style 2nd style	c. 80-50 BC c. 80-50 BC c. 80-50 BC
D	Casa di Caecilius Lucundus Casa del Bell Impluvio	3rd style 3rd style	Early Augustan? Early Augustan?
E	Casa di Caecilius Lucundus Casa del Marinaio Casa del Frutteto	3rd style 3rd style 3rd style	c. 20-10BC
F	Casa di Caecilius Lucundus Casa del Frutteto Edifice of Eumachia Casa di Caecilius Lucundus	3rd style 3rd style 3rd style 4th style	c. 40-50 AD c. 40-50 AD Claudian?
G	Macellum Casa di Amarantus	4th style 4th style	c.50-62 AD
H	Decorations and repair	4th style	After AD 62

Fig.61. Table of plaster groups, buildings, identified Pompeian styles and suggestions on dating according to archaeological and ar historical sources. As to group zero, these plasters appear at levels of the 3rd century BC and earlier.

## Relative chronology

A relative chronology between the plasters discussed above has been established, as shown below. All phases are not represented in any single house investigated. Therefore, an overlapping pattern is used to illustrate the sequences, placing the oldest plasters at the lowest and the later ones at the top. The samples used for relative chronology were removed from plaster layers still *in situ*. Four houses in the present study, Casa delle Amazzoni (CA), Casa del Granduca Michele (GM), Casa del Centauro (CC), and Casa degli Epigrammi Greci (EG) have been selected to show early relative chronologies. Since the later periods have not been part of this investigation, three houses in the previous study, Casa del Bell'Impluvio (BI), Casa di Amaratus (A), and Casa di Cerere (C) have been added as well. The present illustration is based on the joint results of laboratory analyses at CNR/ICBVC and my own observations under the microscope, except for the plasters in Casa degli Epigrammi Greci, where laboratory analyses were made only on EG1B2 and EG1G11. In one case there is not a complete agreement on how to place a plaster type. It regards CA4, which in my opinion might be a "dirty" variety of plasters in group Aa. I just want to add that plasters found at the Edifice of Eumachia belong to groups D, E, and F, and those at Macellum belong to group G and H, just to mention a couple of results at late buildings.

H			--EG1C3	--BI9	--A8	
G			--EG1G8		--A2	
F			--EG1A13	--BI7		--C14
E			--EG2C1		--A6	--C7
D				--BI6		
C			--EG1B8	--BI2		--C2
B		---CC2	--EG1A12	--BI1	--A4	--C9
Ab	-----GM1	---CC1	--EG1G11		--A1	--C1
Aa	-----GM4		--EG1B2			
0/Aa	-----CA4					---CC5
0/Aa	-----CA3					
0	-----CA2	-----GM2				
0	-----CA1					--A52A

## Plastering quality, buildings, and workshops

Next question was, if it is possible to distinguish quality differences in the plastering technique used in important buildings and private homes. Criteria of quality regard lime, filler and proportions between components. The lime may be smooth or contain lumps that are residues from the burning and slaking process. Many small lumps or large lumps are a sign of lower quality than if the lime is smooth, white or creamy white, produced of fine material carefully burned and slaked. A carefully mixed plaster is considered of better quality than if hastily blended. Cracks and voids in the plaster are considered as a sign of low quality, while the absence of shrinkages is good. Criteria for technical quality are the number and the thickness of the plaster layers. If there are several layers of successively finer grain size, a top layer and then the stucco, such a procedure is considered excellent quality. A couple of plaster layers topped with 3-4 mm stucco is considered good, while only one layer or two thin layers of plaster topped with a thin stucco or lime layer is considered as inferior technical quality. Based on these criteria it is possible to answer yes, there are observable differences as far as the plastering technique is concerned. Plasters used at the public buildings at the Forum were of a distinctly better quality than at an average house. The craftsmanship was excellent and the materials of high standard. The medium sized houses in the present study have materials of good standard but not equally perfectly composed and mixed. There is a lower standard in the simple houses and the workshops. Sometimes there is a notable difference between public and private spaces in a private dwelling too.

A following question was if, based on distinctions of the quality of technique, plastering and craftsmanship, it would be possible to individuate specific workshops. At present that question cannot be answered. A qualified guess is that a systematic study might provide further results. There are obvious differences between public buildings and private dwellings; there are differences between impressive private homes and small workshops. There are some technical and material variations that may be indications on differences linked to regions, and therefore possibly to workshops. As an example, there are sequences of plasters in *insula* I 9 that may point at a local tradition or workshop. If accidental, these distinctions are just indicative of two periods. The matter regards the initial application of a fine-grained plaster, on top of which is a layer of large-grained plaster with decoration in the First style, that is group Ab below and B at the top. The two plasters seemingly belong to the same decoration phase in Casa di Successus as well as in Casa I 9, 8. Further, in Casa del Bell'Impluvio the First style decoration was made on a plaster in group B but the finer grained Ab were found at other areas of the house. In this particular question I seem to be at the same point as regarding "stile zero" in 2005; there is such a possibility but at present no way to prove it. However, most likely some workshops were regarded as the better ones, appointed for the most prestigious jobs. Others were contracted for high-standard decorations by prosperous people,

while a less distinguished workshop or craftsman could be assigned simple jobs for a cheap prize. I do not believe the plasterers and decorators who worked at the Forum would have done a job in the fish-traders workshop in *insula* I 9, 8.

There are notable differences between plasters related to time. As a principle, all decorations in the early and mature First style are of a high quality, after which there is a period of decline towards the end in the transitional period between the First and Second styles. There is a new period of high-class technique in the Second style and the transition to the Third. During a period, Third style plasters reach only medium quality, due to the large grains causing shrinkage and cracks in the plaster. Then again, there are excellent plasters in the late Third and early Fourth style, after which there is a general, gradual decline.

### Considerations on the methods used

The present study has been carried through according to two different systems; the main part, in which I had control over the process from the start to the end, and the second part, in which I had no full knowledge about sampling and discussions that led to results. These different situations have had importance.

In the main part of the study focus was set on early plasters and the archaeologists with whom I collaborated had specific questions related to materials in their excavations. Therefore it became a teamwork, in which relevant information was provided at the start. As the study proceeded, particular samples were sent to Florence for laboratory analyses. My preliminary results were discussed and in case there was some ambiguity or new questions arose, suggestions and explanations were part of this on-going process, which has been very fascinating and rewarding.

The situation has been different as far as second part is concerned, because my method should be tried on already studied and branded plasters obtained in six houses in the Swedish research project at *insula* V 1. Only the fifty-seven reference samples should be studied and placed into the present plaster groups. Instead of regular collaboration *in situ* and discussions on the prevailing conditions, the documentation carried out during the years handed over to me became the main source of information.

At first it seemed an easy task to integrate these samples into the present system, but it took a lot of time and effort. The main reasons are my lack of first-hand knowledge of the sampling contexts, the absence of comments in the plaster reports regarding unsolved problems or odd situations, as well as no comments on my preliminary results. Further, in my study, odd plasters have been sent to laboratory for analyses, an instrument that was not used in the Swedish project. In addition there were obstacles due to slightly different documentation methods, as will be explained below.

Sampling is thoroughly done within the Swedish project. As a rule, all plastered walls in every room in each house have been sampled to define all plastering phases. In my

investigation comparatively few samples are needed to identify plasters connected with selected decoration phases. The documentation in both projects is similar: identification of house, room, wall, and sampling area. Sampling areas are indicated on forms, plans and photos and the plaster type verbally described on sheets. The main difference is terminological: in the plaster reports of *insula V 1* there is no clear distinction between *spolia*, *first layer* and *small remain*, which of course, creates uncertainties since only a *layer* establishes a decoration period of the wall on which it was found.

The basic shared method is to study plaster samples under the microscope, to identify the components and label each sample according to a comprehensible system, to begin with the *plaster type*. All samples within a building with the same characteristics belong to one type, those with other qualities to the next and so on. The difference is that my plaster types are placed into groups which contain plasters of the same kind, found in any number of houses. In the Swedish examination each *plaster type* represents a *phase*, linked to the house investigated. The definition of *plaster type* is strict, and small variations are taken into account. Two layers that evidently belong to the same decoration period but are slightly different are defined as two types and therefore belong to two phases. As a consequence, the numbers of plaster types tend to be many and the phases become many too. This procedure is functional as far as only one house is investigated. The system implies that if a new plaster type is found and is inserted into the arrangement, the branding of plasters later than the new one, must change. For me it was sometimes difficult to sort things out and to make comparisons between houses.

When, on the other hand, plaster types are placed into regular groups it becomes relatively easy to compare plasters in different buildings, because a group may contain plasters of the same kind obtained in many houses. Minor variations between samples are allowed because variations are expected in a product made of natural materials and mixed by man. However, group A always contains plasters that are connected to the First style, E always contains plasters used for Third style decoration and so on.

### Problems – solved and unsolved

Some areas in some houses have been problematic. In most cases problems have been solved by exchange of information, rethinking and cross-checking. However, some problems remain unsolved.

In Casa delle Amazzoni there is a problematic area. On the north wall in the *atrium*, the perimeter wall towards the neighboring house, there are four plaster layers in chronology which represent at least two decoration periods, both of which a red socle. These layers are situated below the present floor level. At a later date the wall was decorated on plaster of group F, connected with the Third and early Fourth style.

The earliest period was made on a plaster, by combined methods identified as belonging to group 0, and the second as belonging to group Aa. Since the second plaster type is of a type known from many early decorations, it is considered as an established phase, definitely in the early First style. Therefore the decoration underneath must be of an earlier period, in this case, the less known group of plasters in group zero. The problem is that the construction method used for the perimeter wall indicates a later date for the wall. However, the plaster of the first phase is compatible with the earlier period of the house.

There were two similar situations during my prior research period, in the double house of Amarantus, I 9, 11-12. In the bar area of house 11 four plaster layers, two of which were decorated, were found in relative chronology below the last floor level. The second layer belonged to the same group as the recognized First style decoration in the house, and as a consequence, the first decoration had to be earlier. The earliest plaster was, according to laboratory analyses, of the same kind as the first phase in Casa delle Amazzoni. I would rather place it in the grey zone 0/A. The second problematic situation was in room 4a where another plaster layer was dated earlier than the perimeter wall. The perimeter wall was partially made of Sarno limestone, partially of rubble and partially of brick that is, representing several building periods. The tricky plaster was found at a small section of Sarno stone blocks. Such an early period would, according to archaeological interpretations, not be likely. At the moment the matter remains unsolved.

In Casa di Marcus Lucretius is a decoration recognized as in the Third style, but the last layer is, according to my results, indicative of a later period. The plaster which I place in group H has several characteristics of group E, many yellow and beige grains, but it seems to be reused material, rather than original "third style plaster". Underneath the layer that provided this plaster is a plaster that definitely belongs to group E, that is, the Third style. The explanation may be that the decoration was totally, or at least partially, re-made to resemble the earlier period. Such re-decorations are known in other houses at Pompeii, but still, there is no definite answer at present.

Most problems are related to plasters that have characteristics of two types, and most common is the question whether a plaster in group A belongs to subgroup Aa or Ab. In those cases the filler has many small rounded particles as well as a lot of crystals, which might be explained as a subgroup or a transitional phase between Aa and Ab. In my opinion, that would lead to a too complex system and therefore, in case there are serious doubts just group A might be indicated, no subgroup.

The problem of subgroup Aa or Ab occurs in several houses that are part of this investigation and in houses in the previous investigation too. In common, there is a decoration consisting of a yellow socle above which there is a string course and the main zone which is white. In some houses the plaster is definitely Ab, in others it has characteristics of both subgroups Aa and

Ab and, in one house, plaster type Ab covered with B, on the latter of which the socle received its yellow decoration. It would have been nice to be able to ascribe only one plaster type to the yellow socles but that is not possible; at present they just belong to the period of the First style.

### How to use the method - suggestions

It is important to create a structure that can be used in a number of houses, and which can be modified when necessary, but without creating chaos. To me the system of *plaster types* sorted according to their components, and *plaster groups* containing plasters with the same characteristics has proved useful, and I believe this structure can be widened to include a more precise dating or any other kind of information that might be valuable in the future. As designed today, the method can be used to study the relative chronology of plasters within one house or for comparative studies of several houses. Most important is to be careful from the start and to as far as possible ascertain that the reference samples are representative; if not, such information must be noted. Plaster samples can be non-representative, if very small or, if crumbly and falling apart. Badly decayed areas of frail plaster and areas of decent plasters may be part of the same decoration period on the same wall. In that case, a second sample, although not strictly the reference sample, should be appointed for comparisons. I have found it very important to make careful notes of observations that are odd; these notes may be very useful later on. Therefore, in case there are doubts whether a plaster belongs to one subgroup or another, or if a dark plaster belongs to group 0 or is a dirty variety of group A, subgroup Aa, the plaster is assigned to the most relevant group with additional information regarding doubts; the plaster might be better explained later.

I have found it very useful to make tables of the components in the filler, as shown in the appendix. Checking and crosschecking becomes easier.

Most problems have been solved by exchange of information, re-thinking and by checking again and again. Such collaboration is of course of vital importance in every kind of interdisciplinary study. If collaboration is not possible, and the investigation becomes a one-sided development there are two choices: either to only study the components in the plaster and present that as research result, or to dedicate time to try to interpret standing structures and earlier construction phases as well, which is, of course quite a different profession; way out of line but in the end, very rewarding.

## Conclusions

The results of the present plaster investigation and of the one completed in 2005, show that the analyses of plaster samples is a functional method that can be used as a complementary tool at excavations.

It has been possible to establish that plasters' compositions change over time, and that the plastering technique did as well. It has been possible to follow the development from the fine brownish plasters of the earliest period, to the exceptional ones of the First style, the short period of decline around the late First/early Second style to the well-made plasters of the Second and early Third, a new short period of slightly inferior plasters and yet another outstanding period in the late Third/ early Fourth style and then, the dark and successively ever more hastily made plasters that are characteristic of the last days of Pompeii. The observations on technique and craftsmanship follow the same pattern as that regarding plasters. The maximum periods are approximately in the mature First style, the mature Second and mature Third/early Fourth style. It has not been possible to connect any specific workshop to specific decorations, but there are variations that might be indicative for different workshops.

The question regarding materials, plastering quality and conservation show there is a correlation between quality and degree of decay; the better decorations and plasters have survived in a better way. But, above all, relevant protection such as roofing or partial roofing of excavated structures, elimination of stagnant water, and regular maintenance proves to be the most efficient and important methods for the preservation of standing structures and wall paintings at an archaeological site.