

# Introduction

## *Background*

The present study concerns materials used for Pompeian wall paintings.<sup>1</sup> In focus are plasters serving as preparations for painting. My earlier experiences in the field of ancient and traditional materials and technology led to the hypothesis that technology reflects not only the natural resources but also the ambitions within a society, a moment in time, and the economic potential of the commissioner.<sup>2</sup> Comprehending ancient technology, reconstructing and using it, would be an advantage in modern constructions as well as for the preservation of excavated wall paintings. Consequently, my starting point was to understand Roman plasters from a practical and technological point of view. Later, I studied plasters in Pompeii for two years within the Swedish archaeological project, which led to the conviction that specific characteristics are linked to plasters, used over time, in Pompeii.

Something makes Roman lime plaster extremely durable.<sup>3</sup> *Reticulatum* walls with remnants of decoration still stand in nature, at times even at the shore close to the sea. Modern preparations would not last for more than a few decades, unless protected and cared for. This is obviously not just a question of mixing lime and a filler, because that is how it is done today. The secret might be in the method of burning and slaking the lime, in the composition of the filler, or the proportions between the components of plaster. It may otherwise be linked to technique, or else to some, or to all of these factors. Paolo Mora claimed that he had reconstructed the Roman wall painting technique, based on the description of Vitruvius.<sup>4</sup> Evidently, this accomplishment was due to Mora's interpretation of the words "*politionibus*" and "*politiones*" used by Vitruvius,<sup>5</sup> which he explained as signifying "*polymēt*", a fine clay used for gilding preparations.<sup>6</sup> Recent experiments in Cologne were based on Mora's description,<sup>7</sup> which

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<sup>2</sup> Freccero 2000a, Freccero 2000b, Freccero 2000c, Freccero 2003.

<sup>3</sup> Plaster intended as lime plaster, i.e. a mixture of slaked lime, water and sand. When the plaster sets by taking up carbon dioxide from the air and drying out to form calcium carbonate, it becomes hard and chemically similar to limestone and marble. For studies on plasters, see Bordignon 2000, Bläuer-Böhm & Jägers 1997, Grave 2002, Ling 1999, Marchese et al 1998, Peterse 1999, Sabbioni & Zappia & Riontino 2001, Meyer-Graft & Ehrhardt 1998.

<sup>4</sup> Mora 1967.

<sup>5</sup> Vitruvius VII, 3. (*Politionibus, politiones* etc. means *smoothing*.)

<sup>6</sup> Mora 1967, 64. "Le *politiones* sono delle terre argillose che oggi vengono chiamate "boli"."

<sup>7</sup> Häfner 1997, 143-152.

Häfner followed by including polymers in some preparations for painting. Polymers are not mentioned in the evaluation of the results, but the mixture of grain sizes in the plaster and *intonaco* was considered to be of utmost importance. The conclusion was that *intonaci*, prepared of fine marble dust, became dull while those “...which were composed of coarser material were quite easy to polish and produced an acceptable sheen...”<sup>8</sup> Plasters that have a variety of particle sizes remain as densified compounds after compression, while fine aggregates do not withstand pressure.<sup>9</sup> Häfner’s observation corresponds with my own experiences, e.g., at the Villa of Livia, an investigation of decorated plasters from the period of the Roman Republic to the third century AD.<sup>10</sup> Early preparations, and in particular those of the Augustan period, were of an excellent quality, made of several layers with successively finer grain size. The smooth and lustrous *intonaco* or stucco had inclusions of large crystals of marble or alabaster, a fact already noted by Cagianò de Azevedo<sup>11</sup> (Figs. 1, 2).

The preservation of excavated paintings was, and still is, a gigantic problem. As a conservator I agree with Marchese et al who state that knowledge about materials is the necessary base for conservation programmes and interventions.<sup>12</sup> Franca Parise Bodoni noted – in 1981 - that less than 20% of excavated wall paintings and pavements remain due to lack of maintenance, as well as to conservation interventions.<sup>13</sup> Portland cement is one of the well-known causes of paintings being lost. In natural humid or damp environments it produces salts that flourish like mushroom colonies, disintegrating the painted surface. The analyses of such salts in Casa del Bell’Impluvio, room 8, east wall, verify that these are caused by cement.<sup>14</sup> Acrylic resins are just as mismatched to lime plasters as is Portland cement. Plastic is an excellent water-resistant material: a good quality that becomes negative on a wall painting, since it prevents the evaporation of natural humidity. This is a problem especially in open-air environments, where humidity caused by rain and capillary suction is normal and must be considered before any conservation intervention starts. Water or dampness is the single most destructive element for material decay; nothing really happens in the absence of humidity. Enclosing water into walls or works of art leads to material destruction.

Modern conservation materials are substances provided by the chemical industry. These chemicals are often toxic and the user should wear safety equipment. Neither is there any reliable information on what happens when the substances are superimposed, one upon the other, which is how they are used in reality; in laboratories they are tested singly. The positive quality is that these materials are readymade and easy to use, while traditional materials have to be prepared by the user.

Protective layers of natural beeswax observed on excavated wall paintings have been removed during modern restoration interventions, e.g. at the paintings from the Temple

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<sup>8</sup> Häfner 1997, 145.

<sup>9</sup> Häfner 1997, 147.

<sup>10</sup> Freccero 2000. Chemical-technical investigation made at the scientific laboratory at the Opificio delle Pietre Dure in Florence by Drs. Mauro Matteini, Arcangelo Moles, Giancarlo Lanterna, Maria Rosa Nepoti, and Carlo Lalli.

<sup>11</sup> Cagianò de Azevedo 1949, 145f.

<sup>12</sup> Marchese et al 2001, 23. “*La conoscenza dei materiali di un’opera d’arte antica, dal piccolo oggetto al grande edificio, rappresenta la base necessaria per ricostruirne la storia e la tecnologia e per programmare eventuali lavori di restauro e di conservazione*”.

<sup>13</sup> Parise Bodoni 1981, 71.

<sup>14</sup> Sample BI 6 sali. Constituted principally by thenardite ( $\text{Na}_2\text{SO}_4$ ). Traces of gypsum and sulphates with sodium and calcium aphthalite, ( $\text{K}_3\text{Na}(\text{SO}_4)_2$ ); syngenite  $\text{K}_2\text{Ca}(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$ .

of Isis,<sup>15</sup> and those of the Roman villas at Stabiae.<sup>16</sup> After various treatments the paintings were protected with an acrylic resin.<sup>17</sup> The famous garden paintings at the Villa of Livia have repeatedly been exposed to violent restoration interventions, and would certainly not have survived if made in a less outstanding technique.<sup>18</sup>

Conservation history from the late 18<sup>th</sup> century and onwards is a story of new inventions, important achievements and serious mistakes. Pompeian wall paintings have been the subject of many kinds of unkind treatments, such as Morriconi's miraculous mixture for polishing the paintings.<sup>19</sup> This mixture, which is all but beeswax, has contributed to the preconceived idea that beeswax is harmful to paintings on plastered walls, when in fact, beeswax does not have properties that can dissolve frescoes or cause serious damage to paint applied *a secco*. Many modern conservation materials are not compatible with ancient technology and furthermore, they age rapidly, often provoking damage to material they were supposed to restore.<sup>20</sup> Acrylics are dissolved in toxic solvents, such as trichlorethane and xylene.<sup>21</sup> These are not good for the conservator, and solvents of this kind "...*may on occasions swell the underlying material or cause dyestuffs to bleed...*".<sup>22</sup>

Conservation is a slow and sometimes very costly affair.<sup>23</sup> Regular maintenance is the only possible way to avoid expensive conservation interventions, and to preserve our patrimony. First aid interventions and security repair with an appropriate lime plaster or stucco is a good investment for preserving Pompeian wall paintings (Figs. 3-5). Lime, sand and water are not expensive and they are non-toxic. Lime plaster and stucco have resisted for 2000 years. These are my reasons for studying ancient technology as articulated in Pompeian wall paintings.

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<sup>15</sup> Cinti 1992, 121-122. "*Dimetilformammide, Xilolo, Tricloroetilene. I solventi sono stati usati sia puri che mischielati tra loro e applicati mediante impacchi con carta giapponese...*"

<sup>16</sup> Miniero Forte 1989, 32f. Beeswax was removed with "*Clorotene... benzina... impacchi di tricloroetano*". Cleaning was made with "AB57", a mixture of chemicals, such as ammonium bicarbonate, sodium bicarbonate, EDTA and Desogen, a biocide, containing other chemicals. Consolidation was made with "Paraloid B72 al 3% trichloroetano".

<sup>17</sup> Cinti 1992, 122. EDTA, "*sale bisodico dell'acido etilendiamminotetracetico*"... "*Paraloid B72, Rohm-Haas, al 3% in Trichloroetano*".

<sup>18</sup> Cagianò de Azevedo 1949, 145f; Cagianò de Azevedo 1953, 13-16.

<sup>19</sup> Borrelli 1980, 81. Morriconi's recipe for surface protection was a mixture of turpentine, alcohol, amber, copal varnish, rubber and sandarac. It had the disadvantage of turning yellow and even to provoke the detachment of colours. See also Vlad Borrelli 1981, 81.

<sup>20</sup> Modern acrylics, such as Paraloid B72, are visually recognized by a hard and uniform lustre. They are transparent when applied but have the disadvantage of turning yellow-brown. When applied, the original surface is lost, since acrylics are, in practice, impossible to remove. Paolo Mora (1998, 94, 98f) refers to comparative tests of inorganic consolidants, such as lime water, silicate esters, barium hydrate and potassium aluminate, but recommends the use of acrylic resin. In *Science for conservators* (Wilks 1999, 115-116), acrylic resins, such as Paraloid B72, are defined as "*a copolymer of methyl acrylate and ethyl methacrylate. They remain soluble and are easily replaced, and are not affected unduly by light.*" For discussions on the chemical properties of acrylics, see Lazzarini, Tabasso 1986, 216-219; Considerations on lime and barium hydroxide, and a less enchanted view on acrylics, see C. A. Price 1996, 17f, 29f.

<sup>21</sup> Torracca 1990, 52, 56-62; Mora 1998, 94f.

<sup>22</sup> Wilks 1999, 116.

<sup>23</sup> On issues regarding conservation, see, e.g., Baldini 1988, Baldini 1989, Brandi 1952, Casazza 1981, Feilden & Jokilehto 1998.

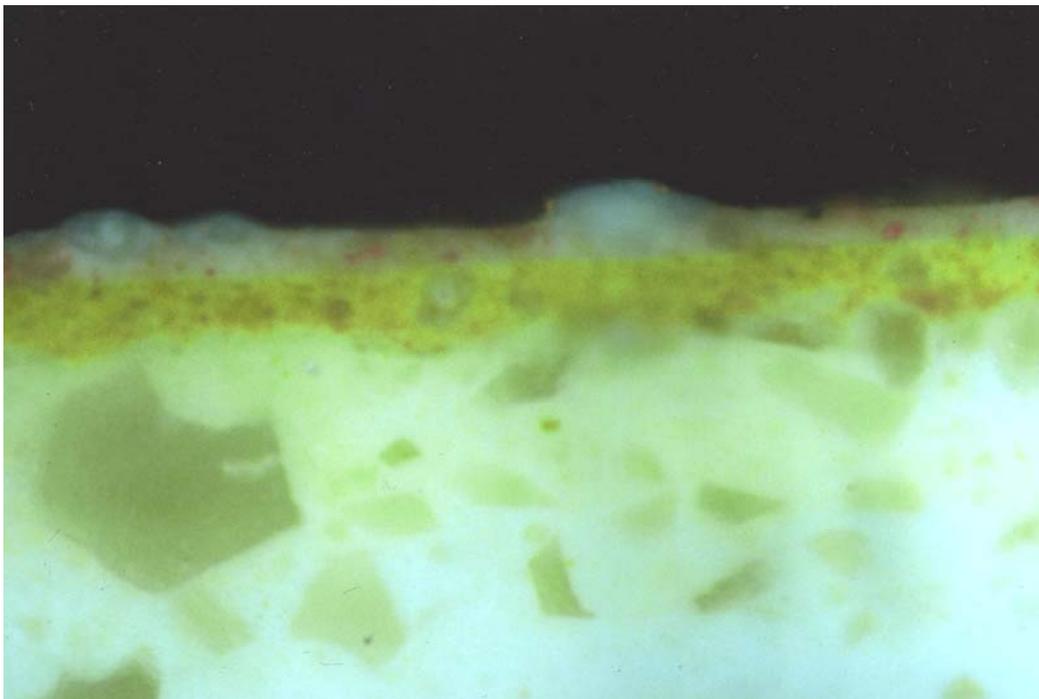
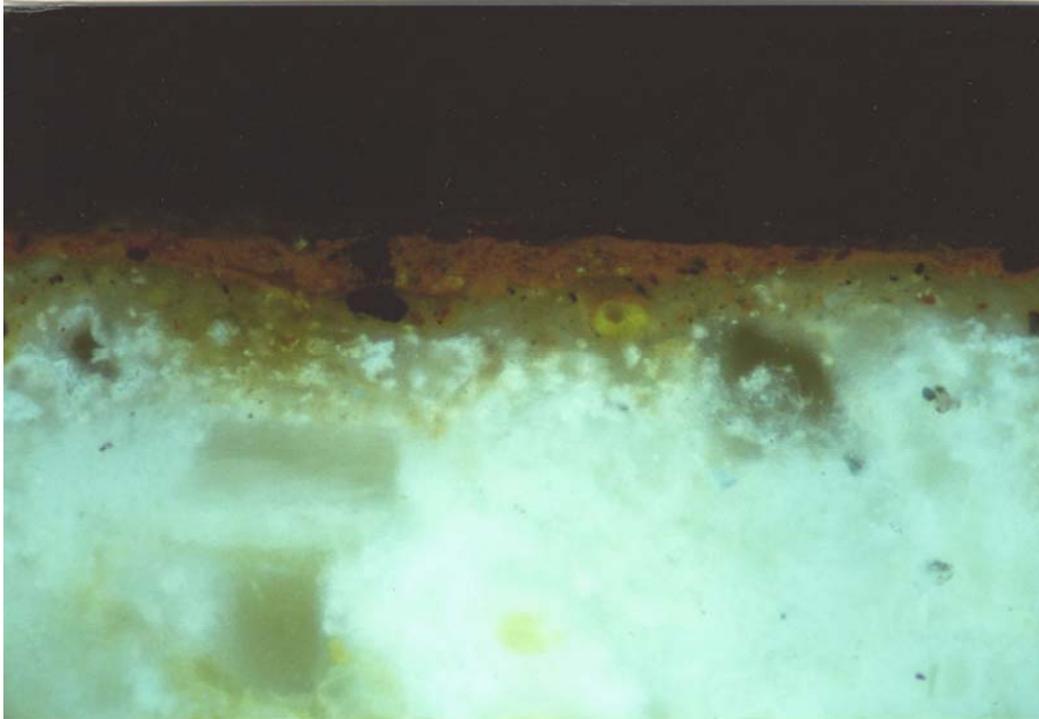


Fig. 1. *Above*: Fragment VL 44A. Sample 32, taken at the red decoration. Grains of red ochre and of carbon may be observed in the upper cinnabar red paint layer as well as in the half transparent layer of beeswax, observable between the paint layer and the preparation.

Fig. 2. *Below*: Sample 34, taken at the ochre decoration. Grains of red ochre appear in the paint layer. Calcite and alabaster crystals are present in the preparation. *Photos*: Opificio delle Pietre Dure.



Fig. 3. *Above*: Edificio di Eumachia, June 2004. Detail. Incised drawings on the east wall in corridor 222.  
Fig. 4. *Below, to the left*: Edificio di Eumachia, December 2004. Large part of the decoration has fallen, and the remaining decoration is at risk.  
Fig. 5. *Below, to the right*: Edificio di Eumachia. One fallen incised drawing.