



ARCHLAB TRANSNATIONAL ACCESS

Final Report

The Renaissance Bronzes Revisited (REBRE Project)

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The major scope of REBRE project at the OPD was to re-review and follow-up a former project held in the Kunsthistorisches Museum Vienna (KHM) dealing with organic patinas on bronze sculptures from the collections of KHM using facilities available at the OPD (FTIR microscope and large FTIR spectra archive in particular) and also to strengthen our personal communications and collaboration between scientists of both institutions in this field.

Present status of the research

Both the Kunsthistorisches Museum (KHM) in Vienna and the Opificio delle Pietre Dure (OPD) in Firenze have already been deeply involved in this field. Particularly in the OPD, studies on the composition of both bronze alloys and coatings, techniques of the casting and the provenance of these artefacts have been carried out, while in the KHM the organic coating (“patinas”) research has been performed aside from the provenance research. The small bronzes have a long tradition of art historical study and connoisseurship including a fine appreciation of their surface “patination” [1-12]. Although many of the original surfaces of the these bronzes have undoubtedly been altered through environmental conditions and aesthetic intervention it is felt that no complete description of these bronzes can exist without taking into account their surfaces, how they may have been prepared and their subsequent fate. Judging from the appearance of the bronze sculptures it can be assumed that they have been treated by varnishing the surface using coloured translucent or opaque organic coatings – usually called “patinas”, which was executed by artists themselves or their workshops and it was meant to alter the appearance of the bronze surfaces, not only to enhance thus



the beauty of a finished bronze sculpture, but also with the intention to hide technical defects from the casting process. In addition, in later centuries these bronzes have been covered by a variety of organic coatings during conservation treatments to prevent the development or progress of corrosion [13-17]. The uniqueness and cultural importance raised our attention to study the surface treatments on this group of objects. The topic dealing with the Italian Renaissance bronze sculptures is rather specific. To better understand the conditions of the single object, to assist the art-historical interpretation, and to enable the development of the best-suited conservation treatment, an extensive scientific investigation of the composition of the materials is necessary. To fully understand the nature of the materials analysed in minute quantities it is crucial to perform scientific investigations using advanced hyphenated analytical techniques, where the combination of various supplementary techniques appears to be optimal to gain the adequate results on such complex samples. Our previous results using gas chromatography-mass spectrometry (GC-MS) technique showed that the composition of patinas appears to be quite similar. They are oil or oil-resinous varnishes [18-22]. The specific colour of the coatings applied to surface of the bronze statues does not necessarily involve pigments and even when it does, they are used in relatively small amounts. Instead, the colour is developed by baking the varnished metal. Thus it seems that the final tint, which vary from different shades of browns, ranking from light yellowish-brown, red-brown to dark brown and to black, and the structure of the organic coating, which could be from thin, transparent to thick, opaque layers, does not depend to such an extent on the used materials, but on the process of their application, how they were applied on the surface such as varying the thickness of the varnish film, whether this is accomplished by adjusting the viscosity of varnish when applied, or by using multiple application.

The OPD archives keep reports and analytical data on many Renaissance bronzes. The surface of these bronzes was studied mainly by FTIR, both with the bench instrument on fragments and cross-sections and, in recent years, with the portable, non-invasive device on the artefacts surface. So sharing the experience of the OPD colleagues was very valuable, namely to see how beneficial the FTIR microscope and portable FTIR could be for the measurements to study the patination on individual bronzes.



Time schedule

The study visit was scheduled into 4 working days:

On Tuesday 09.04.2019, after initial introduction with colleagues of the scientific group and after the excursion at the conservation workshops and laboratories of the OPD (see Fig 1), the first meeting was held to introduce and explain the present status of our research and how it should proceed further.



Fig 1. The excursion at the OPD conservation workshops (Monica Galeotti (OPD) and Sabine Stanek, KHM)

The meetings was following-up by first measurements of our samples prepared as cross-sections by FTIR microscope (see Figs 2-3). The FTIR measurements of both samples and reference materials also continued whole following day on Wednesday 10.04.2019.



Fig 2. The measurements with FTIR microscope (Sabine Stanek, KHM and Andrea Cagnini, OPD)



Fig 3. The measurements with FTIR microscope (Sabine Stanek, KHM)



On Thursday (11.04.2019) the lecture “*The Renaissance Bronzes Revisited*” was held by Vaclav Pitthard to introduce the up-to-date results of the research done in KHM Vienna to other colleagues of the OPD and students of metal conservation. During the following discussion with the OPD metal conservators, in particular with a senior metal conservator Stefania Agnoletti and her PhD student Maria Buruffetti, we draw a detailed time-line for a future collaboration in the frame of the PhD thesis running at the OPD and providing us with new literature sources and reference mock-ups (varnished bronze coupons) for new investigations of organic patinas by gas chromatography, which will be done in our department in Vienna. A set of reference mock-ups (see Fig 2) recently prepared by Maria according to the historical recipes has already been obtained to start preliminary measurements this summer.

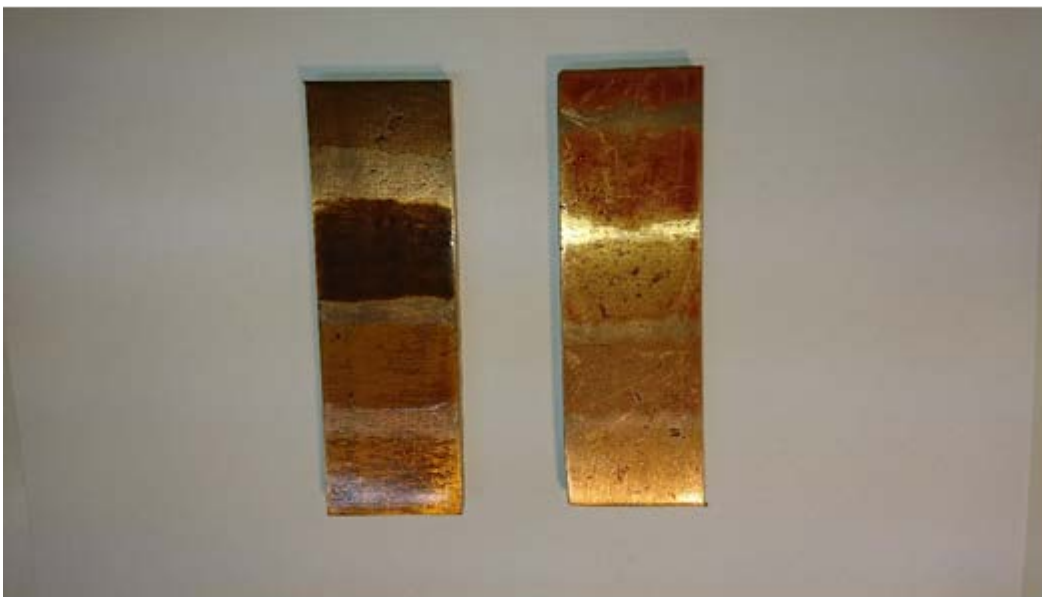


Fig 4. Reference varnished bronze coupons prepared at the OPD by Maria Baruffetti

Friday (12.03.2019) was last day of the study visit, we joined the OPD team to observe the collection of medieval bronze and marble sculptures in the Orsanmichele Church (see Fig 5), which is currently undergoing a conservation treatment. Namely the unwanted discoloration on the surfaces of the stone, which was caused after a previous removal of the bronze-look-like patina from surfaces of the marble statues, was the matter of our observations.



Fig 5. Conservation workplace at the Orsanmichele Church.

Conclusion

The aims of our stay at the OPD have been achieved. The main scope of the REBRE project was to revise the results already obtained in Vienna and possibly clear some of our uncertainties at the material interpretation of our cross-sections using the FTIR microscope and large FTIR spectra available at the OPD. It became clear that the FTIR spectra showed a material complexity of the samples, what is however, causing immense difficulty at the interpretation and identification of particular materials. The newly varnished mock-ups (bronze coupons) from OPD could contribute in explaining the changes in the patinas' compositions caused during their baking process, namely by studying the varnished coupons before and after their thermal treatment using GC/MS.

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