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Scagliola or stucco marble: restoration of the altars in the church of Lichtenfels, Bavaria

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Abstract

Scagliola is a very rarely practiced technique of marble imitation. It is mainly used for interior decorations. Its basic ingredients are gypsum, glue and pigments. Even today, the history and the technology of scagliola are quite unknown. Only few craftsmen possess the knowledge of its preparation. Consequently, we are often confronted with previous restorations of poor quality. First, we give some general informations about the historical development and the procedure of the preparation of scagliola. Then, we discuss some of the problems concerning the preservation of scagliola objects by means of the restoration of the main altar in the catholic church of Lichtenfels in Bavaria. This example enables us to demonstrate some of the most frequent damages and defects caused by previous restorations and to point out possible preservation concepts and measurements. At last, we conclude with a short survey of the present state of knowledge and the consequences for the conservator entrusted with the restoration of scagliola objects.

1 Introduction

Every conservator, no matter in what field of restoration, has to deal with the consequences of previous restorations of poor quality, which might have been executed either using inadequate materials or non-suited techniques.
The aim of this paper is to illustrate some typical problems of restoration by means of scagliola. The basic questions are how further flaws can be avoided and how future restorations can be improved.

Scagliola is a technique which is very suited for the demonstration of general restoration problems. One of the reasons is that scagliola has ever been an almost unknown technique. Even in the past, it was quite impossible to find skilled craftsmen who were also trained for restoration purposes. This situation did not even change until today. So, quite a lot of objects made of scagliola were restored by craftsmen from other fields who knew only little about the historical procedures, recipes and special requirements. The consequence is that we often have to deal with non-suited measurements of past restorations. In addition, we have to reflect upon our present methods and how to improve them.

2 Scagliola: General information

Scagliola is a technique of marble imitation. In Germany, we distinguish between "stucco marble" and scagliola. Stucco marble means the application of marble structures of one or more colors. Scagliola is the more difficult technique of intarsia work made of different stucco marble structures. As the main ingredient is gypsum, stucco marble can only be applied for interior decoration.
Usually, the main purposes of application were the substructuring of walls or the accentuation of architectural details, such as altars, pillars or columns. Sometimes, scagliola was also used for the decoration of fire places or tables [7].

History: Unfortunately, the origins of scagliola and stucco marble are quite unknown and it is also very difficult to find written sources about the development of the technique. The first datable examples can be found in the Residence of Munich. During the reign of Elector Maximilian I., a few excellent objects and interior decorations made of stucco marble and scagliola were created by the artist Blasius Pfeiffer, also called Fistulator (or "Whistler" in English). Those works are dating from about 1590 until 1620. The first examples in Italy are dating from about 1650. So, it is supposed that the technique of the preparation of stucco marble originated in the workshops of the Munich Residence [6], [9].
Works made of stucco marble can not only be found in Southern Germany, but also in other European or Eastern European countries. We know that the preparation of stucco marble had been practiced even in overseas, for example in the United States. During the 18th century, the technique mainly spread in Austria, Switzerland, Eastern Europe and also in France and Great Britain. A lot of objects were created by German and Italian craftsmen and, then, were exported to other European countries.
Famous artists in Southern Germany were for example Johann and Mathias Schmuzer, Dominikus Zimmermann or Johann Michael Feichtmayr. They all lived in or near the village of Wessobrunn, which is located about 60 kilometers south of Munich. Also the Italian stucco specialists Giovanni Battista Carlone and Andrea Solari created stucco marble objects. Both had been working in

Southern Germany, for example in the famous Dome of Passau, near the Austrian border [8].
The earliest marblings from the beginning of the 17th century were imitations of red natural marble. In the following two decades, simple structures of only two or three colors or shades, mostly in red, were preferred. The structures consisted mainly of simple circular forms constantly repeated over the whole surface. From that time we also find a few excellent scagliola works in the Residence of Munich. During the second half of the 17th century, the appearance of stucco marble changed. More different and even contrasting colors like black and red, red and yellow, green or blue and yellow were predominant. The surfaces often were accentuated by large veins.
The application of stucco marble reached its peak in the 18th century, in Southern Germany during the Rococo period. At that time, stucco artists created outstanding stucco marble objects. The spectrum of colors was enlarged. But now pastel-type and less contrasting colors were preferred, as well as smooth transitions from one color to another. During the 19th century, the technique of stucco marble lost its importance, especially in Southern Germany and neighbouring regions [5].

Technique: The preparation of stucco marble consists of two important phases: the preparation of the material itself and the processing of the surface.
The basic ingredients are gypsum, glue and pigments. The first step is to prepare differently colored pastes or "balls" consisting of the basic materials. Then, the colored balls have to be subdivided into small pieces of circular forms. After that, all these small particels have to be mixed together and formed to a large multi-colored ball. The crossection of the ball already shows the marble structures. The "marbled" ball has to be cut into slices of about half an inch. Now, those slices can be fixed with liquid and colored gypsum on a prepared ground. The ground mostly consists of masonry and a layer of plaster or of wooden laths with a layer of plaster. The plaster should be prepared with gypsum, sand and diluted glue. After the fixation of the marbled slices, the surface has to be cut and planed down in order to obtain the appropriate shape.
After hardening of the stucco marble layer, the surface can be polished. This process is very complicated and consists of several polishing steps, normally up to six or even more. Its purpose is to create a characteristic shining brillancy. In order to close the pores, a smooth paste of gypsum, glue and pigments has to be laid on the surface. The abrasion of the layer takes place after hardening. This step has to be repeated up to four times until the stucco marble shows a light brillancy. Now, the surface is prepared for the very important step of polishing which has to begin with a fine layer of liquid gypsum. In Germany, we call this material "stucco". After the hardening of the "stucco" the surface can be polished with very fine abrasives. The process of laying on the "stucco" and the subsequent polishing should be repeated about three or four times. During each

polishing step, a finer abrasive should be used. Finally the stucco marble surface should have a clear and shining brillancy [7], [10].
During the first half of the 20th century, and even later, craftsmen usually took small stone pieces of various degrees of hardness. Now, we mostly use pumice-stone as abrasives for the first steps and then abrasive papers of different grains for the polishing of the surface [10].
Today, usually a layer of natural wax concludes the polishing of stucco marble, a step which is very contested in the field of stucco marble restoration.
Above, we explained the technique of the preparation of stucco marble in the way it is performed today. It is supposed that most parts of the process originated in the 19th century. And here we have to remark that we know only little about the historical technologies of the 17th and 18th century. All the time, there were only few craftsmen and experts possessing the knowledge about the technology. This lack of data even has historical reasons: In the 17th century, Elector Maximilian I. of Bavaria prohibited, by law enforcement, the passing on of the knowledge, a situation similar to the invention of porcelain. In Munich, even one trial is verified against a craftsman who offended against that law. We also know about a correspondence between Maximilian and the Queen of Spain. The queen heard about the famous scagliola workshop in Munich and asked to explain her the technique in order to instruct her own craftsmen, but Maximilian refused to give any description of the preparation of scagliola [9].
The effect is that we are only disposing of few and mostly incorrect or insufficient informations about the historical preparation process. Also the technical descriptions, originating primarily from the 18th and 19th century, contain either incomplete or incorrect explanations [1], [2], [3], [4]. This lack of data about the original materials and procedures has momentous consequences for the restoration of historical stucco marble: On the one hand, we have to deal with quite a lot of misguided measurements and inadequate interventions of previous restorations. And on the other hand, present restorations are taking place without sufficient historical background. So, we always have to call our own preservation methods in question. Sometimes this may even lead to the perception that the best preservation of scagliola is possilbly just to do nothing.

3 The restoration of the stucco marble altars in the church of Lichtenfels

This section is dealing with the restoration of the stucco marble altars in the church of Lichtenfels. By means of an example, we point out some of the typical damages of stucco marble, as well as the defects of previous misguided restorations. In addition, we demonstrate the problems we are confronted with in present restoration concepts and the preceding decisions.
The church was erected in the late 15th century. From that period, the foundation walls, the facade and the gothic choir are still existing. The interior possesses

several additions from different periods, for example baroque altars made of stucco marble in the choir and the transepts, a baroque pulpit in the nave, two galleries from the 19th century and a ceiling decorated with modern paintings from the 70´s of the 20th century.
The baroque altars and the pulpit are made of stucco marble which mostly shows simple structures and a wide range of bright colors, such as yellow, ocre, orange, red, brown or even green. The artists are unknown. The bills in the archive of the church do not give any hints about the craftsmen creating the altars. On the basis of stylistic researches, we can infer that at least two different craftsmen worked on the altars.

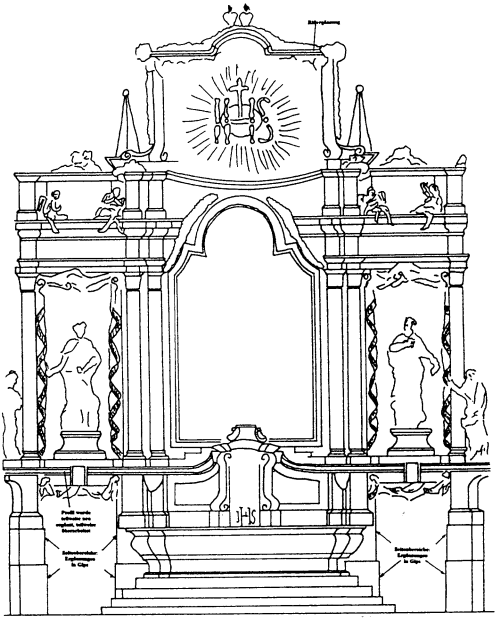

Figure 1: Church of Lichtenfels, main altar in the choir (sketch)

Damages: The most interesting object concerning the condition and the restoration itself is the main altar in the choir. Therefore, the following explanations will only refer to this altar. The object shows a wide range of damages which appear normally on stucco marble. They have partly external causes, such as mechanical stress or changes in the statics of the construction.

The basic construction of the altar consists of wooden laths and a layer of plaster above. Thus, the two basic materials are wood for the ground and mineral mortars for the plaster and the stucco marble layers. Both are reacting differently on moisture and mechanical influences. In addition, stucco marble is a very hard and brittle material, unable to compensate mechanical movements. The consequences are structural damages. In the church of Lichtenfels, we had to deal with cavities between the stucco marble layer and the plaster, cracks of different dimensions, partial detachments of the stucco marble and the plaster from the ground, as well as missing parts in the stucco marble layer. Fortunately, problems caused by any kind of moisture did not exist. Water or moisture normally results in aggravating damages and in the degradation of the substance, mainly because of its content of soluble salts. In the case of stucco marble, the influence of water also leads to the dissolution of the bonds between gypsum and glue, since glue is soluble in water. This may cause degradation of the substance and porosity of the surface.

Figure 2: Church of Lichtenfels, missing and loose parts in the stucco marble layer and the plaster

Additions from previous restorations and defects caused by misguided interventions: Most of the measurements we had to execute were concerned with the effects of previous restorations. A great part of the applications were partial reproductions of missing parts. These reproductions which were appearing on the whole altar, mainly on exposed parts like corniches, were partly of very

poor quality, only made of pure plaster with a painted surface. In most of the cases, the appearance did not match the original surface.

Besides those replacements, we found overpainted parts of the altar. It is supposed that these overpaintings originated in the purpose to improve or beautify some of the marble structures. Most of the layers of overpaintings consisted mainly of acrylic resins and were additions of the last restoration in the late 70´s.

The whole surface of the stucco marble possessed coatings of different materials, consisting partly of shellac, but mainly consisting of varnishes on the basis of synthetic resins. The purpose of the additional and not original coatings was probably the creation of brillancy on the old and porous surface. The consequences were a change of the original character with a brownish shade and a blunt and greasy lustre, as well as the partial degradation of the substance due to the coatings of synthetic resins.

In the 19th century the whole surface of the stucco marble was overpainted with white oil-color, because the baroque appearance with its bright and contrasting colors did not correspond to the taste of classicism. In the following restoration which took place in about 1920 or 1930, the oil-paint was removed with very aggressive corrosives that were possibly neutralized with hydrochloric acid. The effect was a degradated and extremly porous surface without any brightness or brillancy. Another long-term consequence was the intense pollution of the surface with dust and soot settled in the open pores.

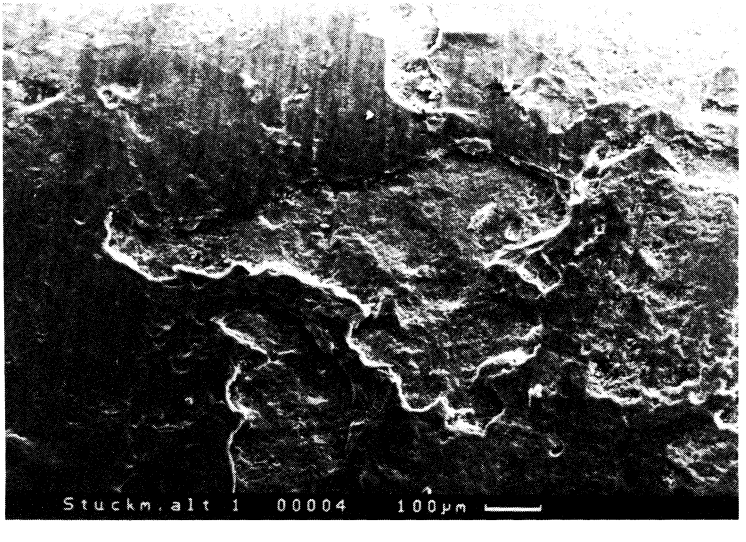

Figure 3: Church of Lichtenfels, degradated stucco marble surface (photograph by electron microscope)

So, one of the most important problems of the restoration in 1993 was the cleaning and subsequent treatment of the stucco marble surface.
The decoration of the altar table differs from the other part of the altar, because it is an addition of the late 18th century and its basic substance consists of a paste only similar to stucco marble. The results of the chemical analysis said that the ingredients used for that decoration were plaster, glue, pigments and additionally slaked lime. The effect was an extreme powdery substance of low solidity and a very thin surface layer of lime sinter which possesses only litlle brillancy and quite a lot of fine cracks caused by the tension between the smooth substance and the relatively hard and brittle layer of sinter.

The restoration of the altar: The restoration of the altar set high demands on the conservators performing the interventions: the preservation of the historical, artistic and aesthetic values, the preservation of the original substance and the present state of the object, the improvement of the superficial qualities, the use of reversible materials and methods, the limitation of repairs only to necessary measurements with the purpose to avoid further decay and damages and the concentration on presevation interventions and techniques. Thus, the restoration of the altars mainly focused on the conservation of the present state and appearance. Reflections of aesthetic nature were of minimal importance. Only the decisions concerning the cleaning of the surface and the removal of the varnishes were partly influenced by aesthetic reasons.

Cleaning: As already mentioned, the cleaning process mainly was performed for aesthetical reasons, but furthermore for technological necessity. As one of the restoration aims was to avoid further degradation, the coatings consisting of synthetic resins were removed. The first step was the performance of different experiments with solvents in order to find an appropriate one. The best result was reached with acetone, which finally was used for the cleaning of the stucco marble. The cleaning was performed only partially which means that the coatings on the surface were removed, but not the particles in the pores. The result was a surface which shows the original colors and also traces of the surface treatment, as well as traces of later interventions which also should be regarded as historical documents.

Treatment of the surface: The most complex problem was the treatment of the stucco marble surface. The decision for the preservation concept with "smooth" interventions was taken in agreement with the Superintendence of Historic Monuments and the Rectory of the Church. The main reason for this decision was the lack of data concerning the original surface of the stucco marble in the church of Lichtenfels. Neither the material itself, nor the archival sources gave any hints. Therefore, in this case, a minimal intervention was the best restoration concept in the opinion of the experts involved in the restoration. The consequence was that the surface had not to be restored and the polishing

processes had to be minimalized. Concerning the grade of lustre, a light and reduced brillancy was preferred to the typical shining surface of newly restored stucco marble, a solution which is mainly practiced by craftsmen.
The first step was the polishing of the whole stucco marble surface with a very fine abrasive paper in order to remove remaining residues of dirt and coatings, as well as the removal of unevenesses. Then, the so-called stucco was laid on and polished after hardening. This process was performed only one time and not, as usual, two or three times. At last, the surface was impregnated with diluted glue which was polished after drying with a smooth cotton rag. A final treatment with natural wax did not take place.

Reproductions in stucco marble material: As we already mentioned, the altar showed some missing parts in the stucco marble layer which had to be replaced using the appropriate historical materials and techniques. Furthermore, we remarked a large quantity of replacements of previous restorations. The greater part of these replacements was of poor quality. So, these replacements which could clearly be seen by the human eye and without optical instruments should be removed and then replaced with stucco marble. Above all, the measurement concerned the lower parts of the altar that are easily accessible to visitors.
Of course, all replacements should be integrated harmoniously with the surrounding original parts and be based upon respect for the original materials and techniques. Therefore, the essential precondition was the chemical analysis of the substance. The results of the examination of several samples were the following: The basic ingredients were gypsum and glue. The colors were mainly iron oxides. Ocre and umbra were used for yellow and brown shades, soot or pulverized charcoal for black colorings and red iron oxid pigments or pulverized brick for red marblings.
The procedure was as following: After the removal of inadequate replacements, the ground layer consisting of gypsum, sand and glue had been prepared and laid on those parts where new replacements in stucco marble were necessary. The next step was the preparation of stucco marble pastes in appropriate structures and colors. It based on the results of the chemical examination. The marbled slices were laid on the ground and cut into the appropriate shape. The polishing procedures were executed in the way as already described in the second section.

Other measurements: Beside the above mentioned measurements, interventions concerning the structural damages were performed. Cavities were filled with liquid gypsum. The filling was limited to cavities of large size or expansion. Loose parts of the stucco marble layer were fixed with liquid gypsum, a material which corresponds to the original material. Cracks were only closed where necessary. This means that cracks of large size were filled with a mortar similar to the stucco marble paste. The surface was also polished up to three times in order to close the pores. The purpose of the filling was to avoid the further penetration of dust and soot. Small cracks were left in its present state. The

essential principle concerning the repair of structural damages was the limitation on absolutely necessary measurements of consolidation.

4 Concluding remarks

In the preceding section, we described basic problems of the restoration of stucco marble and possible solutions by means of the restoration of the main altar in the church of Lichtenfels. The essential decision was the focusing upon preservation and smooth interventions. The main reason for the choice of the preservation concept was the lack of informations about the original appearance and the historical technology. And this situation is characteristic for most of the objects made of stucco marble or scagliola.

In order to complete our knowledge about the historical significance and technological background, further research is to be done, especially in the field of natural science. On the basis of extensive chemical analysis, the original ingredients could be determined more exactly. A further possible field of research is the historical treatment of the surface which has to be performed in cooperation with scientists and conservators. The examination of historical stucco marble surfaces and new ones by the electron microscope, for example, shows an extreme difference in the way abrasives had been used. So far, we also know only little about typical structural damages and their causes. This concerns especially the different reactions of the wooden ground construction and the stucco marble layer on mechanical and climatic influences.

The necessity of further research and more detailed knowledge about the historical and technological evidence of stucco marble is obvious. As far as the situation changes, a conservator has to limit the interventions to preservation only. We even have to call our present methods in question and to dicuss whether the measurements performed by us will cause damages or further decay like previous misguided restorations already did.

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