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## RESTORATION TECHNIQUES

When I started working as a glass restorer almost 40 years ago, there was only extremely limited experience in the field in Italy. Specific products with the required characteristics had not yet been developed, so only a few products that could be used were available on the market and these were generally intended for other purposes. Neither were there any clear guidelines to follow from a formal point of view, so the formal or aesthetic choices were agreed on each time with those who supervised the work, with the consequent subjective assessments. During my work I gathered experience over the years, also empirically, which allowed me to improve and more confidently decide on the aesthetic choices and the products to use, whose range has anyway increased over the years.

I have in any case always kept in mind the basic guidelines of modern restoration formulated by Cesare Brandi in his *Teoria del Restauro*, particularly the concept of reversibility, or the future possibility of being able to return the item to its original state before the restoration without alterations or deterioration in its state of conservation. In addition, the need to differentiate between the products used is still essential, so that these can always be distinguished from the original material.

In the past, the materials used for gluing glass consisted mainly of animal glues, natural waxes and resins (colophonies), plaster of Paris (stucco) and even in some cases sheaths of iron or lead wire attached through holes made in the pieces, as was the case with repairs to ceramics and porcelain. Because of their intrinsic characteristics of perishability and limited durability, and their unsatisfactory aesthetic appeal, they do not respond to modern restoration criteria.

The range of products in use expanded considerably with the advent of synthetic resins, allowing the most suitable product to be chosen to meet the requirements.

In the case of restoring glass, the glues and resins for joining and filling must ensure good transparency and lack of colour, so that the joins between the pieces are as imperceptible as possible, the absence or at least very limited appearance of any exothermic reaction, so as to not extend the phenomena of crystallisation and the formation of *fêlures*, inalterability with aging to guard against perilous detachments or ugly yellowing and finally reversibility over time.

After having for years tried various glues and resins not specifically formulated for glass restoration, I have identified one that in general still meets all the required characteristics. It is a colourless, very fluid, transparent, epoxy resin that can be easily coloured, is reversible with organic solvents and has a limited propensity to yellowing under the action of UV rays, which can be alleviated in advance with a light violet colouring that neutralises the yellow.

The normal procedure follows an established course. After a first provisional assembly with adhesive tape, which helps one find the position of all the pieces (it is almost impossible to insert a piece after gluing the others), the item is disassembled and definitively reassembled, starting from the largest piece or those that make up the base. It has been seen that the slightest error of positioning at the beginning multiplies, producing tiny gradients or very obvious fissures. The position is provisionally held with small dabs of cyanoacrylate glue (an almost instant glue, but subject to weakening over time). The definitive adhesive is then made to penetrate along the cracks, and the excess removed after catalysis with scalpels and solvent soaked swabs.

Sometimes it is necessary to work on items already glued in the past with unsuitable or even dangerous materials, where the glues or resins have attacked and corroded the surfaces, and in this case it is impossible to eliminate the damage.

A more complicated gluing operation is that between the foot, stem and cup of goblets or other tall objects whose contact surface is minimal and glue alone cannot ensure the hold. Very small holes are made on the surfaces of the crack with small diamond studded burrs

and Plexiglas pins of the same diameter are inserted into these and glued. This procedure reinforces the hold of the joins.

The items very often have gaps requiring both structural and aesthetic additions, because a glass item that has gaps is certainly more fragile and can more easily detach or break up again. This also provides a complete image of the piece, which simplifies its reading, also by non-specialist observers.

The work process is the following: after gluing, the missing parts are added by bordering the portion to be completed with a double wall of wax, protruding some millimetres above the glass walls around the gap. It is fixed there by pressing the edges with a heated spatula so as to perfectly seal the cavity into which the resin will be poured. The resin is then slowly poured through small cast openings to prevent the formation of air bubbles. Once it has catalysed and the wax moulds have been removed, the resin can be finished with small burrs, laps and polishing pastes.

In the case of the restoration of the lid of a blue jar (Fig. 1) carried out about 30 years ago, the aesthetic choice was dictated by the attempt to imitate the original colour as closely as possible. I now prefer to slightly differentiate the colour of the additions for museum restorations so that these can be distinguished from the original material. This is a more correct solution than those of early restorations, where matching the work was an absolute requirement (Fig. 2).

At times it may be necessary to add one or more repetitive elements to allow an easier view of the work or to ensure greater stability, if there is certainty about the shape and position, resorting to moulded reproduction of the part to be copied making imprints with mouldable silicon rubber. When polymerisation is complete, the epoxy resin in a colour matched to that of the original glass is poured into the mould obtained.

The 19<sup>th</sup>-century *Salviati Mirror* (Fig. 3), whose frame is covered with little leaves of girasol glass, had many of its leaves missing. These were reproduced with coloured resin in imitation of the originals, at the specific request of the client who wanted an antiquarian procedure.

Another reproduction example is a 17<sup>th</sup>-century zoomorphic lamp with one foot missing (Fig. 4).

At times, when the object is missing an indispensable part that ensures its support but there is no indication as to the shape or size of the missing part, a schematic support in Plexiglas may be used, which intentionally does not suggest the shape but only the possible size (Fig. 5).

The most complicated restoration I have carried out was that made in 1997 on the *Centrepiece* or «deser» from the Palazzo Morosini (mid 18<sup>th</sup> century) (Fig. 6), now in the Murano Glass Museum. This is a large (175 x 150 cm), composite work with trays in shaped wood with mirrored glass, now almost completely altered, which hold architectural elements and border the central area occupied by other compositions that stand directly on the table and form a miniature garden. The long period of abandon in a storeroom awaiting financing for restoration and placement had led to the obvious deterioration of the work. The old (animal) glues had lost their hold, so many of the constituent elements had detached and become mixed up, and layers of dust had made the work greyish and almost illegible. Having only a few old, general, black and white photos as a guide, the most difficult aspect was identifying and understanding the relevance and position of the architectural elements, almost all made up of numerous segments and small sheets, in order to reconstruct all the parts. After cleaning each decorative group the known fragments were assembled and, given that many repetitive elements were missing, and because of static and structural problems, these were reproduced with a silicon rubber mould and inserted to allow easier reading of the work. Observation of the work showed that there were many non-original parts from a previous period, which was explained by the custom of lending the centrepieces out for big parties, and then, afterwards, the broken or missing parts were counted and remade. Additions in plaster were also evident, along with summary gluing with more modern adhesives, especially vinyl glues, and various replacements of flat sheets with modern glass.

I have tried in this summary text to give some examples of the problems and possible solutions in the field of glass restoration, taking as an example the restoration methods developed on some significant objects over the years.

(Translation by David Graham)



Fig. 1 - Insertion on the lid of a Roman jar.



Fig. 2 - Insertion of the side of a cup. Murano, Museo del Vetro.



Fig. 3 - Insertion of some leaves in *girasol* glass on a mirror, Fratelli Salviati, 19<sup>th</sup> century.



Fig. 4 - Mould insertion of a foot on a zoomorphic oil lamp, 17<sup>th</sup> century. Murano, Museo del Vetro.





Fig. 5 - Vase with Plexiglas support at the base. Murano, Museo del Vetro.



Fig. 6 - Centrepiece from Palazzo Morosini, mid-17<sup>th</sup> century, before restoration. Murano, Museo del Vetro.

Fig. 7 - Centrepiece from Palazzo Morosini, mid-17<sup>th</sup> century, after restoration. Murano, Museo del Vetro.