

The Restoration of the Illuminated Pages of the Worms Mahzor

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THE RESTORATION OF the illuminated pages of the Worms *Mahzor* was brought about in the form of "inter-institute" help, in other words, the Institute for Restoration of the Austrian National Library provided the know-how and its laboratories, while the Jerusalem National and University Library sent the manuscript and a restorer from its Institute for Restoration to Vienna where he carried out the restoration under the guidance of the Viennese colleagues. In February 1981 Prof. Malachi Beit-Arié had asked for such help in the following terms:

As you probably know the Worms Mahzor written in Germany in 1272 is regarded as one of the most important Hebrew manuscripts, and is the most valuable item in our collection. This national asset served as a major source for Jewish iconography, illumination, paleography, liturgy and for the study of the medieval Hebrew language. The manuscript had been kept for generations in the Great Synagogue of Worms, was saved by miracle during the second World War, and was finally transferred to the Jewish National and University Library by the German Government. The physical condition of the Mahzor, particularly that of the illuminated leaves, is alarming and deteriorating, and its restoration is urgently needed. Our Restoration Department is rather young, and we lack the experience and the expertise required for restoring this national treasure.

As the Director of the Jewish National Library, and as a paleographer and codicologist in my academic profession, I regard the restoration of the Worms Mahzor as one of the urgent tasks of our Library.

We willingly agreed to his request as it was a very interesting object, and we were particularly happy to be able to help our colleagues in Jerusalem. We would like to add that in this case the more experienced institute helped the younger one; but that quite often, institutes of equal experience help one another when priceless manuscripts of international reputation, or even less valuable but badly damaged codices are concerned. For the library director or for the individual restorers the conservation of priceless manuscripts often constitutes such an enormous responsibility that they willingly consult restorers in other libraries. This case of "inter-institute" help also had the advantage of allowing the costs of this conservation to be kept

relatively low. They only amounted to the travel expenses, stay and materials, and were to a large extent paid for by sponsors and patrons.

The particular value of this oldest Jewish illuminated prayer book lies in its illuminations, and it was their conservation and re-strengthening that presented the chief problem. The making secure of flaking paint and gilding is usually difficult since the consolidating media have to be forced through the layer of paint to where it is bound to the vellum. Moreover the surface of the miniature must not undergo any change, such as acquiring a shine or changing colour. The penetration by new binders is particularly difficult when the film of paint is particularly thick (*impasto*), or where the chalk-bole ground is laid on very thickly. The chalk ground used to be mixed with a binder of animal glue, occasionally with an addition of honey as a natural plasticiser. While honey never loses its flexibility, not even after many centuries, glue becomes brittle in time and loses its binding action. The same is true in respect of the binders used in the pigments. They too were of animal origin, such as fish glue, or hide glue, or gelatine; but also vegetable glues like cherry or plum gum, gum arabic, or extracts from the shoots of young fig trees, as well as egg white and sometimes also egg yolk, were used. Egg white as such is a very strong binder, but it is more likely to become brittle than other binders.

The actual strength of egg white can be appreciated where it was used for the edge gilding of books where the leaf gold is applied to head, tail and fore-edge only with diluted egg white and burnished with agate. Nevertheless the resulting adhesion on the very thin edge of the sheet is so strong and resistant that it does not show any serious signs of wear and tear, even with very frequent turning of pages (as of a prayer book, for example). The proneness to embrittlement is less evident on the edge of the page than on the gilded surfaces in miniatures.

The flaking of the film of paint is not only due to the decay of the binders, but above all to mechanical causes, such as the turning of pages. Therefore illuminated books show much greater deterioration than paintings in gouache or oil that are stationary and hang on walls. But one is again and again surprised that the mechanical damage to miniatures is not greater. Actually, serious decay has only set in in the last decades as a result of the abnormally dry atmosphere caused by central heating in libraries on the one hand, and by more frequent use, more photography and reproduction on the

other. The situation becomes critical when, on opening the book, one finds particles of colour in the joints of the books, flaked-off bits of paint which collect inside the spine. Such cases call for the help of a restorer. But not every book or manuscript restorer is qualified to treat miniatures and consolidate them. Cases of this kind fall between book and picture restoration. In many laboratories these two activities are deliberately kept separate. In spite of the high reputation of the workshops of the Lenin Library in Moscow the illuminations in the codices of this library are restored in the Moscow Institute for Restoration, along with the ikons.

Before undertaking the consolidation of the films of paint one has to consider the possibility of replacing or re-using the original paint media. But this is often problematic because the miniature painter originally mixed his pigments with the binder before painting, whereas the subsequently applied binder tends to remain on the surface of the painting, dry there and produce a strong shine that looks like varnish. Egg yolk painted on later makes the miniature turn yellow. Binders employed in the past, such as parchment glue, isinglass or egg white, can be used, but greatly diluted, mixed with wetting agents and alcohol, and possibly *in vacuo*. Spraying is often better than painting them on.

But before the restorer considers the use of fresh "early" binders or modern synthetic consolidating media, he should try first of all to reactivate the old binders present in the miniatures. This is the approach we used on the pages of the Worms Prayer Book. After taking photographs to record them we cleaned the surfaces of the vellum sheets with a scalpel, glass pencil, and mechanical eraser. This method of cleaning by way of careful polishing is legitimate, especially with vellum or parchment which, after all, had to be prepared for the scribe and illuminator also by means of a polishing process.

Then the sheets were put into a vapour chamber for several hours. A relative air humidity of appr. 90% produces the swelling of the hide glue still present in the vellum (unlike paper which is a felt made of individual fibres, animal vellum is a material consisting of collagen fibres [*colla* = glue]); at the same time the paint binder in the miniatures is intended to swell and its binding action reactivated. This is possible where the glue is of animal origin (fish, parchment, or hide) and also of vegetable origin (glue of the type of gum arabic, or acacia gum), as well as the exudation from the bark of the cherry or plum tree, or the milk of figs. In the present case it was a type of gum which still showed a good swelling property.

After treatment in the vapour chamber the still slightly damp sheets were moderately pressed between sheets of thick blotting paper to optimize the pigment/vellum contact. The consolidation of the film of paint produces at the same time a certain intensification of the colour effect; the colours look more luminous.

Certain parts of the vellum sheets had gone badly out of shape in the course of the past 700 years. This phenomenon can be the result of mechanical wear and tear of the book, or of natural causes (uneven structure, texture, thickness, consistency, accumulation of fat). Each distorted part had to be placed in a special frame and stretched until it had returned to its original shape. This is a very tedious process since the stretching can only be increased little by little every day.

After initial consolidation of the film of paint, and after stretching — the latter, as it were, was to test whether the adhesion of the colour particles had been restored — the state of the consolidation was examined under the microscope. On the whole it

was a success, except for the margins of the gilded surfaces and certain pigment formations where the adhesion was not secure. We decided to use isinglass as the consolidating medium for the chalk ground. This glue is produced from the inner skin of the air bladder of the sturgeon. It consists of high-polymer, strongly swelling albumens (collagen) which, after heating and subsequent cooling, solidify and become a highly transparent jelly. Thanks to its high adsorption property it is an excellent, flexible and durable binder. After application it is completely invisible. The Russian glue produced from the sturgeon of the rivers in southern Russia and the Caspian Sea is regarded as the best. This glue was used for the prayer book in question. It even proved useful for securing flakes of paint.

Other loose parts of the margins of the miniatures were made secure with "Klucel MF" (hydroxypropyl cellulose); the solution in isopropyl alcohol proved to be the best. It was quickly absorbed by the pigment layer without in any way changing the surface of the film of paint.

When the ancient binders prove to be unsuitable for consolidating early miniatures we use, as the next step, a type of cellulose compound, also derived from natural substances, such as vegetable glues (cotton, for instance, is pure cellulose), of which there are many modified types, soluble in water or in organic solvents. They penetrate the flaking film of paint, enter the craquelures and pores, and creep under the pigment until they finally restore the bond between the paint and the ground.

The aforementioned cellulose type Klucel MF offers a choice of 24 solvents or solvent combinations. In long test series it was found in Vienna that Klucel dissolved in isopropanol produces the best binding properties when used on thick, matt, gouache-type layers of paint, and does not impair the intensity of the colours. The cellulose compound does not yellow or brown, and it remains reversible. The fact that, in keeping with their nature, they will gradually disintegrate and eventually lose their binding action in about 150 years is no drawback (in terms of conservation); on the contrary: they will then give way without leaving any residue to new, probably improved consolidation methods.

For particularly brittle films of paint in book illumination various European restoration institutes also use synthetic substances, such as acrylate (e.g. Paraloid) in xylol, polytetrafluoroethylene, or soluble nylon, etc. We regard the use of these synthetics only as the last resort, when we encounter particularly unmanageable pigment formations.

Their drawback is "reticulations", i.e. their solubility and the possibility of future removal decreases, and this represents an obstacle in the event of later restorations. The types of cellulose we have used will present no such obstacle in later years.

One pigment used in the miniatures, copper green (copper acetate), was subjected to a special treatment. This pigment can cause the decay of paper and also vellum. If this happens one can use magnesium salts as buffers, such as, for instance, magnesium bicarbonate. It can be applied in solution as a direct spray, or as an additive to the consolidating medium (e.g. cellulose). Magnesium compounds "inhibit" (insulate) the copper salts. Existing damage can no longer be reversed, but the decay is stopped.

Copper pigments are subject to a gradual transformation process which can destroy them as well as the medium. The disintegration mechanism of the Cu pigments is only partially known, and a research project to get to the bottom of the phenomenon is being worked on jointly in Vienna by four

Institutes (the Institute for Restoration, Institute for Colour Chemistry of the Academy of Fine Arts, the Vienna Technical University, and the Berlin National Library; and subsidized by the Volkswagenwerk Foundation). So far it has been found that, where copper green mixed with large quantities of paint medium was applied to vellum, where parts of the film of copper green had been covered, and where the ground contained magnesium compounds from the outset, Cu acetate has

no destructive effect. This discovery has already been partly used "therapeutically".

Only the illuminated sheets of the Worms *Mahzor* were restored in Vienna. The Jerusalem colleague was himself able to deal with the conservation of the written pages. After binding readers and students will again be allowed to handle this valuable prayer book.