

Chapter III

Conservation of paintings

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1. PRINCIPLES OF CONSERVATION

The primary meaning of conservation of a painting is consolidation of all parts of it. Before any intervention, its state of decay must be examined, its use and environment taken into consideration ; its historical, esthetical and functional values have to be estimated. An agreement should be reached between owner and restorer about restoration procedures ; however, the restorer often should be able and willing to resist again the owners claims, if these might cause drawbacks for the integrity, safety or originality (faking !) of the picture as a whole or in parts. Very delicate decisions are often connected with the problems of cleaning and taking off overpaints, when they are of historical value. Allowance should be made only after discussion of all relevant arguments and reliable results of a thorough examination. Similar reservations are due against the transfer of paintings onto a new support, an extravagant and hazardous operation one might often avoid with only preventive stabilisation methods and better climatization.

Therefore all painted and non painted elements forming a picture must be preserved and equally taken into account for conservation. The materials and processes used should not produce any negative alteration and thus should stay reversible even after a long time. Finally one may never forget that we cannot and may not totally eliminate the history and fate which old paintings have suffered. The right equilibrium between mere conservation and protection on one hand and respectful and cultivated restoration of its esthetical and functional values on the other hand always will depend on the knowledge and experience of the restorer.

Responsible work within this field has to carry out all relevant documentation. This concerns both examination by photographic and analytical means and all kinds of intervention to the object itself. Besides the written or photographic material, substantial samples of overpaint, forms of decay, inscriptions or earlier interventions etc. have to be collected and carefully identified.

2. MAINTENANCE OF PAINTINGS

2.1. *Various functions in relation to decay and conservation*

Confronted with the rich variety in forms, techniques and functions of painting in history, we focus mainly on easel-paintings. Mural-paintings, wallpaper, woven tapestries or stained glass-windows are not discussed here. Nevertheless we find three different groups to distinguish with regard to specific intention and use, that sometimes changed once or more times during existence.

a) Paintings on movable support but connected with architecture may be part of the decoration of walls or ceilings, of altars in churches ; they serve for embellishment within precious furnitures : their original purpose has sometimes been forgotten.

Judith by Giorgione at Leningrad, Ermitage, was originally a painted chamber-door.

b) Easel-paintings in the nearer sense of the term cover a wide range of varieties, mainly defined by their different supports : canvas, wood, stone, metal, ivory (miniature-pictures), cardboard and paper, leather or glass (*Hinterglasmalerei*). They are created to be moved independently, along with their attached frame.

c) Some paintings have a temporarily changing function such as several kinds of flags, carriages, wall hangings, lanten-veils, theatre-curtains, Chinese scroll-paintings, Tibetan thankas, etc.

2.2. *Climate*

Climatic conditions are the most important factors to be taken into account for the right conservation-process. In well controlled museum-conditions, for example, moisture-protections can be kept at the very minimum, whereas in churches one has to forsee strengthening of support and moisture-barriers. Long-term differences of temperature and relative humidity of the air (winter-summer variations of climate) are harmless if they are not too extreme. Short time vacillations, however, cause dangerous tensions within the painting, as it reacts to the surrounding atmosphere.

Ideal climate in general would be between 10-20°C and 50-60% relative humidity. Paintings on supports of metal, textile cloth, paper may be kept in dryer conditions ; wood and ivory more to the humid limit ; stone and glass are unaffected by humidity. A painting consisting out of various materials will be more sensitive to alterations due to the environment. Very delicate pieces need special showcases with their own constant moisture equilibrium.

2.3. Lighting

Lighting may promote damage both by raising temperature (longwave infrared-rays) and by alteration-effects like bleaching of colours or degradation of cellulose fibers (short-wave ultraviolet-rays). Nowadays accepted lighting limits are 50 Lux for watercolours, textiles, miniatures — 150 Lux for oil paintings and all inorganic materials.

Protection may be realised by reducing light sources as much as possible, putting them out of show-cases, using cold lamps combined with UV-filters, etc. Drawings, water-colours, tapestries and miniatures normally should be kept in the dark.

2.4. Framing

Frames are of artistic and of protective value for the pictures. Medieval double-side painted panels should never be taken out of their frame. Since the Renaissance, framing has become more and more independent from the painter's creation.

Frames with curtains (17th century, Holland) and protective glasses (19th century) reveal the knowledge of light and dust protection. From the 16th century on, backs of canvas paintings in churches have been isolated from the walls by wooden backings (e.g. El Greco), or by using double cloth or charcoal fillings as moisture barriers. These measures have been proved to be adequate and therefore should be preserved when they are found, or introduced where they seem necessary.

2.5. Further precautions

Against beetles or microbiological attack, periodical fumigation with hydrocyanic acid or ethylenoxide is effective. But watercolour paints and textiles need attention on this behalf to avoid darkening of the lead-white colours or metal-threads by these fumes.

Desinfection of painted surfaces has proved effective with thymol or formaldehyd (for oilpaint with oil of cloves too). Mineral salts or petrol derivates (phenols, creosotes) are useful only for long-term protection on wooden backings. They may cause reactions and darken the paint itself. We must insist on the fact that every restorer working with chemicals and solvents should be aware of the right precautions to take for his own health. In

addition to climate, lighting and framing precautions mentioned above, correct measurements should be taken for storage, handling, transport and exposition of paintings ; this is essential for their safeguarding and preservation.

3. CONSERVATION OF SUPPORTS

3.1. *Wooden supports*

Recent conservation of wood-panels tends to preserve original materials and constructions along with original framing and backing. From the 18th to the 20th century an important number of European pictures on panels have lost their genuine support and have been transferred for easier transport, mostly to canvas ; this resulted in severe drawbacks. Yet we are able to solve most of the difficulties involving old panels by correct maintenance (see point 2) and adequate conservation-measurements. Consolidation of wood weakened by rot or insect attack is done by impregnation with neutral acrylic resin solutions (for example Paraloid B82 or 72, 5-10 % diluted with equal parts of acetone, white-spirit and cellosolve) in baths or by infusion methods. For severe decompositions reinforcement with diluted epoxy-resin may be useful to fill internal gaps. Glueing of fissures and loose boards can be performed with water soluble synthetic adhesives on polyvinylacetate (PVA)-base. Addition of lost forms can be realised with selfmade pastes of the same glue or with excellent epoxy-based master model paste (Araldit SW + HW 426). For reinforcement of panels a simple but effective traditional method consists in glueing canvas strips on the rear joints. Instead of stiff joint-clamps in form of « swallow-tails », small pieces of the same wood or veneer, fibres parallel to that of the panel can be glued on the joints for strengthening. Fixed or elastic additional cradles of various materials onto the backsides have not always proved to be effective ; they are dangerous if they stress the panel. Within the suitable framing, however, individual mechanisms can help to obtain constant elastic pressure without forcing the panel to break. Doing this, the old rule has to be respected that within the framing the panel must be allowed to move itself across the direction of the fibers.

Moisture-barriers help together with climate-control to minimize the shrinking and swelling reactions (rheology) of the wood. Impregnations with solids (shellac, waxes, synthetic resins) or covering with metalfoils are effective and may be combined with a fungicide and an insecticide in the same operation. A method in fashion now fixes pieces of balsa-wood with wax to the back forming an inlay-system. A disadvantage of this method is the covering and hiding of the original reverse and the time-consuming working-process involved. Equally effective and much easier to do is the foresaid impregnation ; then wooden slabs are put behind the panel within the framing. Moisture-barrier, reinforcement and protection are thus satisfactory enough.

3.2. Textile supports

Canvas-paintings too should whenever possible be kept in their integrity regarding the cloth and its original seams, the nailing onto the stretcher (without or since 1750/1800 with keys) and sometimes wooden backings and framings. From all of this important information may be drawn that enables us to set up the best individual intervention.

For museum display, relining seldom will be necessary. Conservation may concern glueing of fissures, reinforcing of edges, seams and joints by adding cloth strips (but never opening joints). Total worn or cut off pieces however have to be relined. So do huge as well as paintings on canvas on walls or ceilings of churches or castles with strong climatic stresses. The individual choice of the right fixative and reinforcing textile material must depend on the characteristics and defects of the original fabric, priming and painting technique (two main groups : gluebound and oil-resinous medium).

Normally one first does all conservation procedures on the original picture, such as glueing of fissures, flattening and fixing of cupped and flaking, ground and paint layers. For conservative impregnation of oil paints aqueous solutions of methylcelluloseesters with diluted resins (mastic, dammar, polymethylmetacrylate — but never colophony) and swelling agents (alcohol, polyglycolesters) are used in various mixtures. Pressure is best done under vacuum-control and must continue until the canvas has thoroughly dried. To avoid surface damage, preliminary protection of paint-layers by a quick-drying varnish or provisional paper-layers will sometimes be necessary. Every pressure-intervention needs correctly chosen buffers of elastic sheets and nonadhesive foils (silicon-paper, polyvinylchloride-transparent).

If additional relining is inevitable, silk, cotton, canvas or glass-fibre-fabric may be prepared for the adhesive method chosen. For museums, only weak contact will be enough using cold pressure with starchglue. For paintings in monuments strong and moisture-repellent adhesives are a better choice. For instance, mixtures of qualified beeswax or synthetic waxes with mastic or acrylic resins at 60° C or heat-sealing at 40-60° C with acrylic or other synthetic emulsion (like Beva 371). The waxglass (silk) fabric methods result in a transparent relining that allows reverse inscriptions, drawings or signs to remain visible. For ceilings or other very stressed textile supports a second reinforcement consisting of aluminium or neutral hardboard may be helpful.

3.3. Paper, ivory, leather, lacquer

Paper materials need dry and acidfree storage conditions, as well as protection against strong lighting. Miniature-paintings on parchment or paper with water colours may need disinfection against microbiological or insect attack, wet cleaning of stains, neutralisation of acids (ink or colour reactions) ; before those operations the water-resistance of the colours always

has to be evaluated. Chemical bleaching of stains, re-glueing of weakened paper-material and paper-pulp additions of losses may be further needed. Broken ivory miniatures can be glued with fish-glue, warpings flattened by swelling with vinegar under soft pressure.

Leather was sometimes used for picture support too, but has mostly been adopted for painted costumes, tapestries, antependia, etc. Besides disinfection, regeneration of brittle leather with mixtures of bone-oil and waxes or synthetic lickens (from Hoechst) and cleaning with leather-soap are frequent conservation needs.

In lacquer-paintings of oriental origin or their European imitations from the 18th century, normal wood-conservation has to be undertaken for the supports. Repair of laquer with the genuine material is done only by special trained craftsmen from Japan. Coloured wax-pastes are a useful substitute for it.

3.4. *Metal, stone, stucco, glass*

These substances in various forms have been painted on with binding-mediums in the cold manner (enamels or stained-glass-paintings are distinguished by the melting processes of their production). One can reassemble broken pieces of the above mentioned material with synthetic acrylic or epoxy adhesives. Missing parts can be reconstructed with similar adhesives combined with powders of similar nature to the object, used as fillers.

4. CONSERVATION OF PRIMING AND COLOUR

4.1. *Consolidation*

When deciding upon the right method for consolidation of paintlayers the restorer has to consider the materials of supports, priming, underdrawing and underpaint. Powdering colours, cracks and flaking paint or blisters on rigid supports have to be fixed before any treatment of the support. Pictures with cloth or paper underlaying can be treated combining both operations.

Gluebound primings need humidity for swelling and cellulose and soft glues for fixing : oil-resinous colours swell by solvent action and can be fixed with drying resin-solutions. If first trials are revealed effective, only vapors of these swelling agents (by means of vapour-boxes) or spraying should be used. Modest heating by infrared-radiation, or heating-tables combined with pressure normally are of great help against very hard cuppings or flakes. Fire-blisters or damages from acids on painting-surface, however, need very specialized case-studies for successful remedy. Traditional wax-consolidation of colours is not in favour now because of its irreversibility when deeply penetrated.

4.2. *Regeneration and cleaning*

According to the binding-system and the resulting surface-aspect of the colours used (mat, medium lustre, brilliant gloss) or of metal-foils with or without varnishes, picture-restoration should correctly try to reactivate the primordial light-refraction as far as possible. The term *regeneration* was introduced around 1870 by Max von Pettenkofer for touchless remedy of blinded pictures by alcoholic vapours. Now various solvents and procedures are in use for specific treatment of the many individual stages of decay affecting paints and their varnishes.

Cleaning of gluebound mat paintings is allowed only by soft dry cleaning without any strong mechanical forces (gum-powders, electric rubbers, solvent-compresses). Dependent on the mediums, solutions of fishglue, of methylcellulose (aqueous or alcoholic types) and polyvinylalcohols can be used for regeneration (acting as mat varnish as well).

For oil-resinous paints mastix or acrylic varnishes are qualified. The latter can be diluted with additional solvent-combinations, which may serve for better solving of overpaintings and darkened varnishes. But they always have to be tested on minor parts to avoid any overcleaning. All effort should be given by the restorer to keep the original or another existing suitable varnish. Altered resin varnish-layers can be softened by means of the reforming-processing (spraying of alcohol-mixtures) and after short time taken off with soft cloths and without any rubbing. This is important for pictures with dark colours and thin glazes mainly because of their sensitivity to solvents, increased by intensive rubbing. Overprimings and overpaintings, which cannot be weakened chemically have to be taken away only by delicate scalpel-work controlled under the binocular-microscope. All cleaning operations have to be supervised with the respective examination-methods like ultraviolet-fluorescent light, cross-sections of overpaintings and, when necessary, with comparative chemical analysis of the cleaning products on various parts of the picture.

4.3. *Fillings and retouchings*

After consolidation, cleaning and regeneration of colours, it has to be decided how conservation of the actual state is achieved best with respect to the practical functions and esthetic values of the painting. For the first case only the losses (holes) of the support may be filled (see 3) and then tinted in their native tone of material. Extant borders of paintlayers should be protected by fillings of chalk-ground or wax to slope down sharp margins of colour-isles.

Besides fillings of the support-material under colour-level, neutral ones might be filled at the level of priming or colours with stucco-pastes and tinting of a unique 'neutral' tone according to the surrounding colours.

Instead of surperficial tinting, the fillings could be admixed with pigments and various granulations (like charcoal, red or brown earth, etc.).

The binding agents of every stucco for fillings must be softer and more elastic than the original material.

Thirdly, there is the method of totally retouching, known as 'invisible'. Retouches however can be distinguished either by close-eye view and UV and IR examinations or with help of the latter methods only. Mainly in Italy theory and practice of the *tratteggio* — or *rigatino* — manner have been developed to a very high standard, that is only additive colour-mixture by fine stippling of pure colour-touches. Using this one takes reversible water-colours for both mat and glossy paints and only the latter will be varnished after finishing. Oil paints need to be used scarcely in retouching because of darkening and long drying-times. Egg or casein tempera may be used for underpainting, but tends to harden and become brittle when laid on too thick ; it also becomes difficult to solve after some time. Modern acrylic watercolours may be used instead.

As a rule the restorer has to be aware that retouchings and fillings, like all other additions, have to stay reversible and should not alter remarkably with time. Their medium and way of impainting varies considerably in regard to individual purpose and local traditions.

However ethical principles should be respected : addition has to stop when form and colour are not clearly given. Therefore hypothetic reconstruction and especially any falsification are strictly forbidden.

4.4. *Varnishes*

About original varnishes of paintings in earlier times very little is known. They always should be examined seriously and left, if there is some evidence they still exist. Whenever possible one should try to reuse old varnishes by means of reforming or vapour-regeneration (see 4.2.) Further we have to investigate if all parts of the painting have been covered by varnish or not. Medieval compositions mostly show unvarnished gilded or mat-blue backgrounds that naturally have to be spared. Many paintings of the 20th century never were varnished by their creators and should be left without varnish.

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6. RÉSUMÉ

À propos de la conservation des peintures, l'auteur met l'accent sur les principes généraux et les exigences internationales actuelles en la matière. La fonction, la valeur de chaque œuvre doit être évaluée, de même que les causes de sa dégradation que l'auteur regroupe en quelques catégories importantes. Des conseils en matière de climat, éclairage, encadrement et désinfection sont donnés. Les principales techniques de restauration sont évoquées pour le bois, le textile et autres matériaux organiques et inorganiques. Préserver l'intégrité et les caractéristiques technologiques originales de l'œuvre doit rester la préoccupation majeure. Enfin, il est question de la conservation des couches préparatoires et picturales (consolidation, régénération et nettoyage), du masticage et de la retouche des lacunes, de l'application du vernis et des problèmes que cette application soulève.