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PICTURE VARNISH

Picture varnish is of the spirit or lacquer type, consisting of a nonvolatile substance and a volatile solvent. The nonvolatile component is usually amorphous and thermoplastic, exhibiting little resistance to solvents. Picture varnish cannot be allowed to accumulate by repeated applications and thus disfigure the surface. Moreover, it is frequently necessary to renew the varnish when repairing the painting. For these reasons the spirit, rather than the oleoresinous, thermosetting type is employed. The latter is usually more resistant to removal by solvent action, as well as by mechanical means.

The removal of varnish mechanically (by abrasion or pulverization) is possible, but removal by solvents offers many advantages of convenience and control. The solvent used to apply or to remove the varnish should possess minimum tendency to act upon the painting. Since linseed oil is thermosetting in character and since egg tempera is based on an emulsion of water, protein, and oil, there is a much greater resistance to organic solvents by these traditional media of painting than by the varnish.

Picture varnish has two functions: to protect the picture and to control its appearance. It protects the paint from dirt and abrasion and also from vapors, by retarding their transmission. To provide additional protection from water vapor, a coating of wax is sometimes applied, either directly to the painting or as a layer on top of the varnish. In controlling the appearance of the picture, varnish affects gloss and, in the case of the etched surface of old paint, reduces diffused reflection from this surface, permitting the color and design to be seen. The thickness of picture varnish when dry varies, but is frequently in the range of 15 to 60 microns.

The nonvolatile film-forming component is usually amorphous, in the sense that it exhibits minimum characteristics of crystallinity. The traditional materials are dammar resin from the Dipterocarpaceae family of trees which occur in Malaya and the East Indies, and mastic resin from

the tree *Pistacia Lentiscus*. These resins may be dissolved without heat in turpentine or, in the case of dammar, in petroleum. They comprise an extensive mixture of compounds. The chief constituents of dammar have been recently shown to be triterpenes. Chromatographic analysis, infrared analysis, and comparison of certain physical properties show that the two are similar. Perhaps their greatest inconvenience in use is that they may discolor and markedly alter the appearance of a picture in the course of several decades.

To circumvent certain other disadvantages of the traditional resins as well as their tendency to discolor, museum authorities and suppliers of art materials have experimented primarily with three synthetic resins: poly(*n*-butylmethacrylate), polyvinylacetate, and a resin based on polycyclohexanone. Resin AW-2, a product of Badische Anilin and Soda Fabrik, represents the latter type. The problem of picture varnish is currently under active investigation at laboratories in leading museums throughout the world. The table summarizes physical properties of the principal resins employed in the protection of pictures and now under renewed investigation. It may be seen that the poly(*n*-butylmethacrylate) and polyvinylacetate possess more nearly the properties of high polymers and as such form a different class of material from the traditional resins.

The finishing and protection of each painting must be approached on an individual basis. Frequently it involves more than the simple application of one of these varnishes. Porous areas of a painting are often sealed up, or the newly painted compensations of lost areas in paintings are isolated, by coats of varnishes that are not soluble in the picture varnish to be finally applied. Shellac, which is alcohol-soluble, has been occasionally used for this purpose.

Conservation of Paintings. Paint may be defined as a suspension consisting of finely divided solids (pigment) in a fluid (vehicle, binder) which, when applied to a surface, yields an opaque or translucent film upon drying. The physical

	Dammar, Mastic	AW-2	Poly (<i>n</i> -butyl methacrylate)	Polyvinyl Acetate
Viscosity Grade ¹	1.4-1.9	1.3	27-50	9-80
Sward Hardness ²	81	~86	30	63
Solubility Grade ³	(34-56)*	~3	25	89
Color, 20% solids by wt. ⁴	2-4	<1	<1	<1
Relative Brittleness ⁵	2.6	4.0	<0.1	0.6-0.1
Refractive Index, 20°C	1.54	1.52	1.48	1.47

¹ Centipoises, viscosity at 70°F. at 20% solids by wt. in toluene.

² Hardness at 70°F., 50% R.H. 1.5 mil film on window glass.

³ Per cent toluene by wt. in *n*-dodecane to give clear solution at 25°C.

⁴ Gardner K₂Cr₂O₇ Scale.

⁵ Diameter of mandrel-bend necessary to cause extensive cracking of 1.5-mil film supported on 1-mil aluminum foil at 70°F, 50% R.H.

* Value equivalent to turpentine.

structure of an artistic painting may be considered as a system of four principal components: support, ground, paint, and protective coating. At the base is the support: paper, canvas, wood, fiber board. Following this in many cases is the "ground"—the preparation of a surface upon which to paint. The ground traditionally contains white pigment. In paintings upon paper this layer may be absent, but canvas and wood must be especially prepared to receive the paint. The ground may be paint originally soluble in organic solvents, but on wood this layer is most often a mixture consisting chiefly of aqueous glue, gypsum, and white pigment, a preparation known as *gesso*. Upon the ground is placed the picture, a layer of pigment held together by the vehicle. On the very top of the various layers may be placed a protective coating: spirit varnish in oil paintings, fixative in pastels. Division into four principal components is, of course, arbitrary and much simplified. Oil paintings generally possess an elaborate series of layers; water colors are usually less complex. A particular technique may be notable by the absence of one of the components. For convenience, additional layers may be classified as parts of the ground, picture layer, or support.

The materials of painting, except for the pigments, generally consist of organic substances which tend to deteriorate by oxidation, enhanced by heat and light. In addition, they may become hosts to mold and to insects. The conservator's task is to retard deterioration of the art object and to reduce incidental fluctuations—in other words, to minimize change. Changes in temperature and relative humidity, as well as vibration, direct violence, abrasion, and contact with fluids, hasten the destruction of the painting complex.

The field has frequently been referred to as the "restoration" of paintings. However, since it is not possible to restore objects to their original condition, the word "conservation" is now considered to be more appropriate. Conservation involves preventive measures as well as the repair of disfigurement in the design and of structural flaws such as losses, cracks, tears, cleavage of layers, and distortion of the support.

In the conservation of the support, torn paper must be patched and stains removed. Walls bearing murals must be shored up and sealed against moisture. Wood, with its ability to change dimensions with humidity, to warp and to crack, gives rise to many problems. Because canvas becomes embrittled in time, the backing-up of old canvas with the added support of a new one, or the complete transfer of the paint to a new support, are well-known procedures in the conservation studio.

The ground may crack, dry out, and separate from the support or the paint. However, it is the conservation of the paint layer itself, the principal component of the artist's design, with which the conservator is especially concerned. The cracking of old paint is a familiar feature in old paintings. Blisters of paint must be reattached and losses filled in. Many laymen regard the painting-in of lost areas as the principal area of conservation. This discussion illustrates, however,

that it is but one aspect. While many persons disagree regarding the extent to which the compensation of lost areas should imitate the original work, it is generally agreed that it is only proper to compensate the missing parts. Many early restorations, on the other hand, involved elaborate repainting of both lost areas and areas of original paint.

If the condition of the support, ground, or paint is sufficiently serious, the painting may be transferred to a new support. This most delicate of operations is facilitated by temporarily supporting the entire painting from the front by a facing of paper, employing an easily removed glue. With the painting thus held in position by strong paper, one may remove a part or all of the support by careful cutting away from the rear. If necessary the ground also may be removed and replaced during this operation. The painting may then be attached to a new support, after which the facing paper is removed and the varnish in its turn repaired.

If the picture is to be protected by varnish, this is usually of the spirit type, although occasionally wax may be added directly to the picture or on top of a layer of varnish. The virtue of a spirit varnish is that it is usually easily removed in solvents which act more quickly on the varnish than they do on the painting. One fundamental reason for this is that oil paintings, for example, are executed in thermosetting medium, which as it ages becomes cross-linked and exhibits reduced tendency to dissolve in organic solvents. The conservator, however, must have special knowledge of the history and techniques of paintings, because certain types of paintings are executed in mixtures of oil paint and spirit varnish. The varnish component of such a mixture usually remains soluble, and special care must be used when applying solvents to a painting executed in this manner.

Until 1850 the care and refurbishing of paintings was largely the domain of the artist. The person involved was, and still is, of course, seldom the one who created the object. With the rise of physical science, it became increasingly apparent that the artist's knowledge of his materials was limited. It was also realized that the special knowledge of the long-term behavior of paintings and of the materials used in their construction and care constituted a special field. In the 20th century, technical laboratories have been established at a number of prominent museums. In recognition of the international importance of this field and the desire to raise professional standards in the care of art objects, in 1950 the International Institute for the Conservation of Museum Objects was incorporated, with headquarters at the National Gallery, London. The organization publishes a journal and abstracts of the technical literature on archeology and the fine arts.

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Cross-References: *Protective Coatings, Paints, Binding Agents, Drying Oils, Vehicles*