The Art and Science of Cleaning Paintings

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ABSTRACT. The topic of cleaning covers a large technical area of conservation that has been subject to periods of considerable controversy, which has constrained progress. The complexity of the technical debate on cleaning has limited useful discussion outside the conservation profession. To understand the subject in its entirety, many interpretive skills are required for a multidisciplinary approach. Scientific research, as demonstrated by the acrylics cleaning project, can provide conservators with better knowledge of materials, new ideas, and tools. A history of artist varnishing and conservation cleaning practice is limited by the paucity of literature and material evidence. Trends must be inferred from more recent practice. Developments in solvent, aqueous, and mechanical methods for varnish removal and for cleaning unvarnished surfaces are briefly discussed. Examination and analysis of paintings and materials are keys to understanding artists’ methods more precisely and to interpreting their intentions better.

INTRODUCTION

The cleaning of a painting means the removal of any unwanted material that has been deposited on its surface since it was created, including any coatings applied initially to protect the surface that have subsequently deteriorated. This may be a varnish, even one applied by the artist, if its aging has changed the appearance of the object. It may also be any accumulation on its surface either from atmospheric deposition or by accretions of material from specific activities, perhaps of historic interest. Decisions on what or how much to remove must be taken in the context of a position on how the painting should look. The conservator’s unique role is to contribute knowledge of what is technically feasible for the expectations of the results of cleaning. However, this is rarely how the problem is posed in everyday life.

In the past there have been several periods of intense interest and controversy, particularly on the subject of varnish removal, for example, the arguments surrounding Titian’s Bacchus and Ariadne in the National Gallery in London in the 1960s and also the cleaning of wall paintings or ceilings, such as Michelangelo’s Sistine Chapel. In all these cases the underlying argument is not technical but based on opinions on what the paintings should look like, and consequently, it is open to the views of a wide range of participants with significantly differing expertise and perspectives.

The technical debate has been almost entirely restricted to the conservation profession (Rees Jones, 1962). The experience of broadening discussion has not been rewarding since the complexity of the issues is sufficient to deter casual interest or even the
valid concern of art history or museum professionals (Gombrich, 1962). Books aimed at a popular market have not obviously brought enlightenment (Walden, 1985). This problem extends to other professionals, such as art historians, museum directors, or artists, none of whom are likely to have the background knowledge to add significantly to the technical debate.

As a consequence, roles have developed that not only stifle debate but also allow the subject to be ignored. At one extreme the conservator is encouraged to make all the decisions, perhaps within a framework of institutional practice or previous work, and at the other the relationship between curator and conservator is one of art owner and contractor, where the conservator is expected to deliver a predetermined result. Clearly, neither of these extremes can be relied on to produce the best outcome.

Even within conservation, individual practitioners are not well equipped to understand the background science, and research scientists cannot expect to understand all the practical issues. In effect, the problem is truly multidisciplinary, and each individual can only deal with a part of it. Inevitably, in such a complex, unforgiving, and sometimes subjective area we tend to remain in our circle of comfort. Not many varnish removal specialists would feel that they have a complete overview of their field, and this extends to the subject of dirt removal from polychrome sculpture or modern paintings. So the Cleaning 2010 International Conference was a great opportunity to not only bring together the best expertise but also for each participant to learn more about unfamiliar aspects of cleaning (Phenix and Sutherland, 2001).

By single-mindedly concentrating on the undoubted technical challenge the conservation profession has not brought its technical knowledge to the wider ethical and aesthetic debate as effectively as it might have done (Hedley, 1993). Visual change to a painting after cleaning depends on many uncontrollable factors. The removal of an overall toning layer affects some pigments more than others, and the relationships between colors may change surprisingly. The nature of removed retouching and any replacements can have a greater visual effect on the treated painting than varnish removal. Understanding the nature and degradation of paintings unconnected with cleaning is essential since cleaning frequently uncovers problems not considered in the original decision to clean. Paintings change in many subtle and unquestioned ways, developing craquelure, becoming more transparent, and revealing pentimenti and tonal discrepancies. Pigments fade and mediums yellow or darken, and an increase in contrast between whites and darks revealed by cleaning can change the reading of perspective.

HISTORIC PRACTICAL FRAMEWORK

Cleaning starts with the decision to protect the surface. If an artist ignores the issue of dirt accumulation and the work is left unprotected, as is the case for many contemporary paintings, for example, color field paintings or acrylics, then dirt will be absorbed by the surface of the paint. Its removal may become a challenge or even impossible to carry out safely. At best, it will be difficult to predict the response of an unfamiliar paint to the method of cleaning, and if the work of art is an unforgiving unmodulated paint film, it may not allow the conservator any room for experiment or error. Several groups are making progress in the study of the problem of cleaning synthetic paints. The acrylic cleaning project is a good example of the conservation profession predicting and preempting a problem while there is still time to address it and options exist for a variety of solutions, including better prevention (Ormsby and Learner, 2009). It demonstrates the application of scientific method to a new and major conservation problem that requires radical innovation.

Historically, artists have protected oil painting surfaces with varnish, a system that allows the varnish to be brushed clean or even washed relatively frequently to remove accumulated surface dirt without exposing the paint to risk. Unfortunately, mastic or other traditional soft-resin varnishes do not last indefinitely. After a few decades the varnish becomes yellow and brittle, losing transparency, and the cleaning process is transformed into the more challenging problem of removing the degraded varnish directly from the picture surface. Even when new, a varnish changes the appearance of a painting. It increases the transparency of any partly coated pigments or low refractive index medium, and it imparts a new surface, which is frequently glossy. Mostly, artists have accepted such immediate changes in appearance for the future benefits of protection from dirt and from the risks of dirt removal. Inevitably, because of its sacrificial purpose, little early varnish material has survived, and there are surprisingly few detailed historical references to varnishing, but the best evidence is that artists throughout the history of oil and tempera painting employed varnish (Dunkerton et al., 1990). Some types of paintings, such as tuchlein, were not varnished, but few examples have survived. Court painters of the sixteenth and seventeenth centuries used varnish comprehensively, leading to the establishment of the first recorded varnish removal campaigns (Veliz, 1986). By the eighteenth and nineteenth centuries, when state academies controlled much professional painting practice, the need for a varnish became de rigueur. The concept of finish embodied many notions and became an unwritten contract of quality and reliability between academician and purchaser of art. It seems likely therefore that professional artists and their clients or patrons have always considered the application of varnish as a necessity of permanence and that artists have chosen to exploit its properties for both visual and practical benefit.

Many artists, through ignorance or untidy practice, continued painting up to exhibition deadlines and then immediately brushed varnish onto undried paint. Notoriously, J. M. W. Turner mixed soft-resin varnish, such as mastic, in his paint to improve its short-term handling properties and even continued painting after varnishing. Adding a soft natural resin to oil paint remained popular into the middle of the twentieth century (Doerner, 1934:156–160, 187–189). It provides a glossy surface but in quantity prevents the oil from becoming sufficiently cross-linked
to resist a solvent used to remove the varnish. Cleaning, then, has much to do with artist's painting practices and their consistency throughout a painting.

In the modern period the use of varnish has been questioned, at first as a reaction to the controlling academies and then as a challenge to the concept of permanence. The Impressionists realized that a yellow varnish would alter their high color tones and kill blue or purple shadows. With the center stage moving away from the academies the role of varnishing seems to have been left to commercial concerns. Dealers continued to apply varnish, even to Impressionist paintings (Swicklik, 1993) and to sellable sketches or unfinished works, which could be given a shiny finish. Increasingly, however, their clients came to value the creative process as part of a change in perception and philosophy, particularly to encompass the constantly changing industrial nature of the world. Much of modern art explores creativity and originality, and this does not sit well with the notion of finish or, indeed, longevity (Learner, 2000). Closer to home, we might recognize the museum replacing the academy as the ultimate arbiter of taste and taking over from the patron as the champion of permanence. What is clear is that we cannot now assume a consensus on the old certainties of what a work of art is for, how long it should last, and how it should be presented.

These are huge philosophical issues that conservators cannot be expected to consider on their own (Mancusi-Ungaro, 1990). Yet, increasingly, the context of conservation is left undefined; the assumption is that the conservator gets to work and efficiently removes the material that obscures our view of the work, thereby revealing the genius of the artist. When this succeeds, the conservator shares some of the appreciation that is due to the artist, and when it disappoints, the conservator may feel a sense of failure. Of course, removing a darkened amber filter from a colorful painting can be dramatic, yet it is an act of faith that much of the subtle relationships will be improved by cleaning. These can rarely be judged through the darkened varnish.

Annual spring cleaning can simply be a matter of brushing or vacuuming dust from a varnish. Washing with water is more effective and may need to be done every decade or two. This normally requires a wetting agent to ensure good contact with the varnish surface and to trap dirt within the surface of the liquid. Traditional recipes including potatoes and onions are well known (Sitwell and Staniforth, 1998). Saliva is still considered effective, and many other materials have been recommended, including borax and urine. The top 10 μm of a varnish are most susceptible (Sitwell and Staniforth, 1998); the interaction of oil with pigments (Keune 1990) using, for example, spirits of wine has been carried out for centuries (Caley, 1990). The alternative of using abrasion to break up the friable mastic film has also been a long-standing mainstay of cleaning paintings. It was in the eighteenth century that artists began to modify their mediums by the addition of varnishes and waxes. In combination with the introduction of oil varnishes and the retouching of damage using oil paint the job of the restorer became much more difficult (Carlyle, 1990). Unwanted oil had to be broken down without damaging original paint using chemical means. Saponification or alkaline hydrolysis was the method available, typically achieved by the use of lye soap or pot ash. Then, as now, the problem of controlling the reaction on the surface of the painting provided a considerable challenge. Alkaline material must be confined to the area to be broken down and then removed or neutralized to prevent further reaction without spreading it onto delicate original paint. Evaporative ammonium hydroxide–based formulas have found favor. The removal of tough old oil films can also be helped by applying mechanical methods of scraping or lifting with a scalpel, sometimes combining reagent, solvent, and scalpel methods iteratively to deplete the overpaint. The process requires great skill, concentration, and effort, with the recognition that the room to maneuver is minimal and that any slip is likely to cause damage.

Solvents have been, and frequently remain, the first choice for conservators for removing a varnish. Traditionally, spirits of wine and turpentine have been the most readily available solvents since distillation was brought to Europe. Essential oils such as lavender, rosemary, cloves, and many others were also available as restrainers. In the nineteenth century, more specific chemicals became available.

Ruhemann (1968:270) described the margin test, which involves using very small swabs to check each area and confine any potential damage at the level of visual resolution. Stolow (1956) measured the swelling of paint films by organic solvents, providing the first framework in which to compare our choice of solvents (Feller et al., 1959). Stolow’s interpretation met with criticism from practitioners, who realized that it distorted the model of the cleaning process by ignoring rates of solvent evaporation, which are used to control exposure during evaporative swab cleaning. More recently, Phenix (2002) has raised new concerns about this research. For progress to come from scientific research, projects need to be well informed by practitioners in order to address the right questions, and researchers need to translate their results into the conservators’ studio practice (Ormsby et al., 2007). The next step is to report back to the scientist the practical experience of any new method in order to refine the analysis and repeat the cycle.

The Teas (1968) diagram was the first three-dimensional map of solubility, providing a better theoretical framework (Hedley, 1980), but as Feller pointed out, a map does not tell you where you are, it is only useful when you have located your position. There is still much more to learn about the drying of oil paints and the behavior of dried linoxyn films (Mecklenburg and Tumosa, 1991); the interaction of oil with pigments (Keune...
et al., 2005) and natural resins; the behavior of these systems on subsequent oxidation and deterioration (Erhardt and Tsang, 1990) and how all this affects the swelling of paint by solvents (Hedley et al., 1990) and water (Michalski, 1990).

Alternatives to solvents have been championed by Wolbers (1988), who has proposed a new approach to cleaning paint surfaces and has put into place a theoretical framework to give his suggestions credibility. The careful selection of appropriate surface active agents in water-based systems can be effective in removing oxidized varnishes and oil varnishes as well as dirt. Initial concern was centered on doubts about the effective clearance of nonevaporating high molecular weight material, but these concerns have largely been addressed (Khandekar, 2000). Wolbers’ formulations have provided new tools to remove stubborn material more controllably.

Unvarnished paintings are a relatively new challenge to conservators. During the 1970s a group of unfinished Turner oil sketches were cleaned at Tate (Williams, 1989). An interesting group, they had over 120 years of dirt accumulation since they left the artist’s dirty studio (Phenix and Burnstock, 1990). In some cases the tentative sketches could not be seen through the dirt. Various water-based cleaning methods were tried, such as saliva, dilute ammonium hydroxide, and nonionic detergents. All removed much of the dirt layer but left an uneven gray on the predominant white absorbent ground. The problem was how to pick up the residual gray layer. The solution chosen was to use a plasticized polyvinylchloride eraser (Mars Staedtler) through a water-wetted surface. The dirt was incorporated into the eraser and removed from the absorbent surface (Hackney, 1990). Later, triammonium citrate was tried on similar material and found to produce the same result. It acted as a chelating agent, latching onto molecules associated with the dirt particles (Carlyle et al., 1990). Wolbers (2000) explains why lead was detectable on cleaning swabs.

Textile and paper elements are frequently exposed on modern works of art. These are absorbent surfaces with hydroxyl groups that readily attach to particles, drawing dirt in with capillary forces and trapping it mechanically in its open fibrous structure. Wet cleaning methods can be effective at dirt removal but can dramatically change the surface texture and appearance. Dry cleaning with powders is less effective, even with bread, where some moisture is present and largely bound to the bread. A combination of gentle abrasion and dirt pick up leaves the overall surface cleaner and intact but is not sufficient to deal with localized stains. Various suction systems devised for paper and textile conservation can be applied locally.

Whether removing dirt or varnish, there are many examples of conservators using ingenuity, borrowing from other disciplines, extrapolating from traditional methods, or just intelligently employing a repertoire of established techniques. But when working on individual paintings, assessing the results can be difficult and rarely allows true comparison with alternative methods. Scientific studies can better do this job of explaining observed successes and analyzing mechanisms.

More detailed examination using cross sections or increasingly sophisticated analysis can reveal the construction of the paint and varnish layers (Mills and White, 1987). This can tell a conservator how much dirt is on the surface or under the varnish and where any original glazes sit in the paint layer and reveal evidence of retouching. It may also identify a very thin layer of glair varnish (Peres, 1990) or one that gives the paint film a patina (Philpott, 1966). Ultraviolet fluorescence identifies the extent of varnish and earlier retouching, and local cleaning tests reveal the varnish solubility and localized response of the paint to solvents. A knowledge of artists’ methods derived from the study of other paintings as well as an interpretation (Brandi, 1949) of the painting being cleaned is important prior knowledge, a mental model of what is expected, allowing a more detailed investigation of the work in question. Materials analysis can reveal the pigments and main medium, and increasingly, it is possible to detect minor components, such as the all-important additives to the medium, which can change its properties significantly.

CURRENT SITUATION

In recent years there have been many studies of artists’ materials and techniques, in part to understand an artist’s intention but also to assist with a conservation treatment. It is essential to know how consistent an artist is in the use of materials, for example, the addition of varnish or wax to paint to improve its handling or dried properties; reworking an area; scraping down paint; overpainting; painting wet on wet; leaving the work for a long period during painting; using novel application methods, such as palette knife, spray gun, collage, or frottage techniques; creating texture by the addition of coarse material or the extraction of oil medium to form an absorbent surface; combining different media either in layers on the painting or premixed on the palette; or using poorly bound pigments. The possibilities are endless, and knowledge of the existence and location of all such potential problems is important to the conservator, helping to prevent misreading of the artist’s intention and to distinguish between original and later material. It is the conservator’s duty to understand the artist’s normal range of practices and to examine the painting to develop a model of what the artist might have done. If the resources are available, and increasingly they are being demanded, some analysis can be made to address the questions raised by the conservator’s examination (Hagan, 2007). Informed with this knowledge the conservator makes predictions on how the varnish and paint will respond to the chosen cleaning method and can gradually explore the painting surface.

REFERENCES

Caley, T. 1990. “Aspects of Varnish and the Cleaning of Oil Paintings before 1700.” In Cleaning, Retouching and Coatings: Preprints of the IIC Brussels Con-


