INTRODUCTION

This study presents an initial investigation into the surface characteristics of the uppermost paint layer of paintings, i.e., the finished final paint surface. The primary focus is on how to characterize differences in surface morphology between intact and damaged paint in order to understand how small local disruptions (primarily abrasion) at the very surface of otherwise intact paint affect the overall visual impression of a painting. To what extent does surface abrasion or the additive effect of small areas of surface abrasion interfere with our reading of the picture? When viewing a painting, a broad spectrum of the surface phenomena contributes to our perception (natural aging, such as color fading and shifts in color, discolored varnish, cracks, results of restorations, etc.).

To better understand this phenomenon, differences between intact and abraded surface areas of the same paint layer were examined using a variety of analytical techniques (Figure 1). Gross abrasion that exposes distinctly different lower paint layers was not considered. A way was sought to record subtle visual differences and to qualify and quantify them, with the goal of using this information in restoration strategies.

PROCEDURE

A study of paint samples was undertaken to identify the morphological and physical characteristics of the surface before and after cleaning, with and without an intentional abrading. Various analytical means were used to study surface morphology, such as digital photography, colorimetric studies, roughness measurements (confocal white light profilometry), and microscopic observation, both stereoscopic and scanning electron microscopy (SEM). These were used to evaluate and categorize characteristics that contribute to our perception of a painting (Figure 2).

IMPLICATIONS IN THE RESTORATION OF PAINTINGS

Does the damaged surface of what, on first appearance, may seem to be an intact paint differ visually from an otherwise undamaged paint? Can the analysis of surface
phenomena of a paint film have a direct effect on the direction of a painting restoration? As is the case with a collection of visual effects, even subtle disturbances to the surface can and do alter its character. The restoration of a painting often includes the restoration of missing paint in order to reestablish the original, albeit aged, appearance of the composition.

Controversy as to the extent to which a restoration can or should be carried out can be found in almost every discussion on the subject (Walden, 1985; Bomford, 1994; Garland, 2003; Bomford et al., 2004). Although retouching actual paint loss (including glaze layers) and abraded paint that exposes underlying color is widely accepted in the practice of painting restoration, retouching or “toning” to restore only the damaged surface of otherwise intact paint is more often questioned. Observing what constitutes the surface of a painting and to what extent subtle disturbances play a role in the actual appearance of a painting may aid in understanding to what extent subtle damage plays a role in the actual appearance of a painting and also add insight into treatment options.

FIGURE 1. Sample of slightly aged lead white paint. Note that the surface of (left) the unabraded area is visually darker than (right) the abraded area.

FIGURE 2. The SEM micrographs show (left) the cross section and (right) the surface of the samples. The micrographs on top show the unabraded paint, and those below show the abraded one. In the cross sections, the once smooth surface (top) is, after abrasion, jagged with loose pigment particles (bottom). The surface, smooth and closed before abrasion (top), becomes open and porous in the abraded paint (bottom). In an older painting the medium would be naturally oxidized and discolored. The absence of medium and the open exposed pigment particles could result in shifting the color away from the surrounding more intact paint.
SUMMARY OF RESULTS

Abrasions through the surface of naturally aged discolored paint, such as lead white, lead tin yellow, or copper resinate green, can often be readily observed as points or areas of bright color, usually located on the peaks of impasto. The bright area is then surrounded by aged, less colorful paint (Figure 3).

Once familiar with this type of abrasion where contrast is high, a restorer can recognize more subtle shifts in color in broader planes of seemingly intact paint. The contrast, which can be dramatic, can be instructive in understanding the original use of color by the artist; however, it can also have a disruptive effect on the composition. Microanalysis confirms that the color shift is indeed the result of differences in surface structure between undamaged and damaged paint. Carefully retouching such actual damage to the paint surface, with only a slight wisp of retouching paint to eliminate the visual disturbances, can have a considerable effect in unifying the overall appearance of the picture. Identifying, acknowledging, and restoring damage to the naturally aged paint can reintegrate and visually harmonize abraded color passages, resulting in a subtle yet recognizable aesthetic impact on the overall composition that in no way compromises the artist’s original intention, but rather reestablishes it.

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REFERENCES