An Investigation of Cleaning Methods for Untreated Wood

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Abstract

In the context of this study, "untreated" wood signifies the absence of coatings such as paint, wax, varnish or any other protective coating on the surface of the wood. Two main factors are considered to evaluate cleaning methods for this application. First, there is potential for the wood to become physically abraded or burnished during the cleaning process. If the wood becomes burnished as a result of the mechanical action of cleaning, a change in the overall surface gloss, or sheen, may occur. Second, there is potential for cleaning product residue to be left embedded in the wood grain or surface cracks. This residue could potentially cause direct discoloration due to its presence, or stain and discolor the object as the trapped material ages and deteriorates over time. These two factors are evaluated using three analytical methods: spectrophotometry, visual microscopy and ultraviolet fluorescence.

The study also involved the participation of eight conservators from the Museum of Modern Art. Each conservator cleaned samples of untreated Douglas fir plywood using the same dry cleaning techniques and materials. A baseline was created to eliminate the subjective and variable force that is applied during the cleaning process by individual conservators. This parameter was essential to define in order to make the results of this study useable.

Introduction

In 2001, a group of sixteen Douglas fir plywood wall pieces from 1978 by Donald Judd in the collection of the Chinati Foundation were requested to be loaned to the Tate Modern in London for a three-venue, European retrospective of Judd's work. These sculptures had not been loaned before and are in nearly pristine condition, so the possibility of the loan sparked an investigation into cleaning methods for untreated plywood (fig. 1).

A preliminary study was conducted to locate published material regarding the cleaning of untreated wood. This provided an opportunity for research and collaboration between the conservation departments at the Chinati Foundation and the Museum of Modern Art, where Roger Griffith, Associate Conservator of Sculpture, had previously undertaken a study and presented the results of dry cleaning methods used on *Study for a Glider Nose*, by Charles and Ray Eames[1] (fig. 2). The glider nose cone is also made from untreated plywood and was constructed to be part of a nose section and fuselage of an all-wooden, experimental military glider.

While MoMA does not have any of Judd's plywood pieces in their collection, there are numerous fine-art and applied-art objects in their collection that can benefit from the results of this study. The Judd sculptures and the Eames glider nose cone are examples of art objects that illustrate both the broad range of possi-

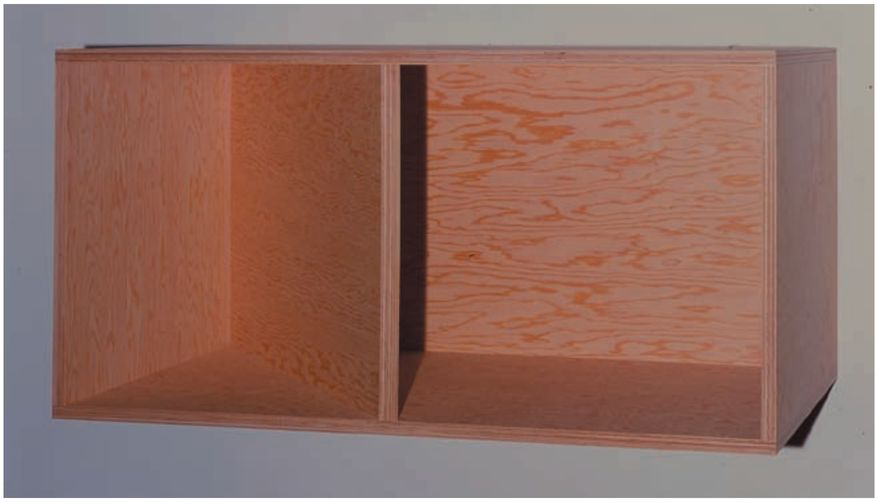


Figure 1. Donald Judd, untitled wall piece in Douglas Fir plywood, 1978, collection of the Chinati Foundation, Marfa, Texas.

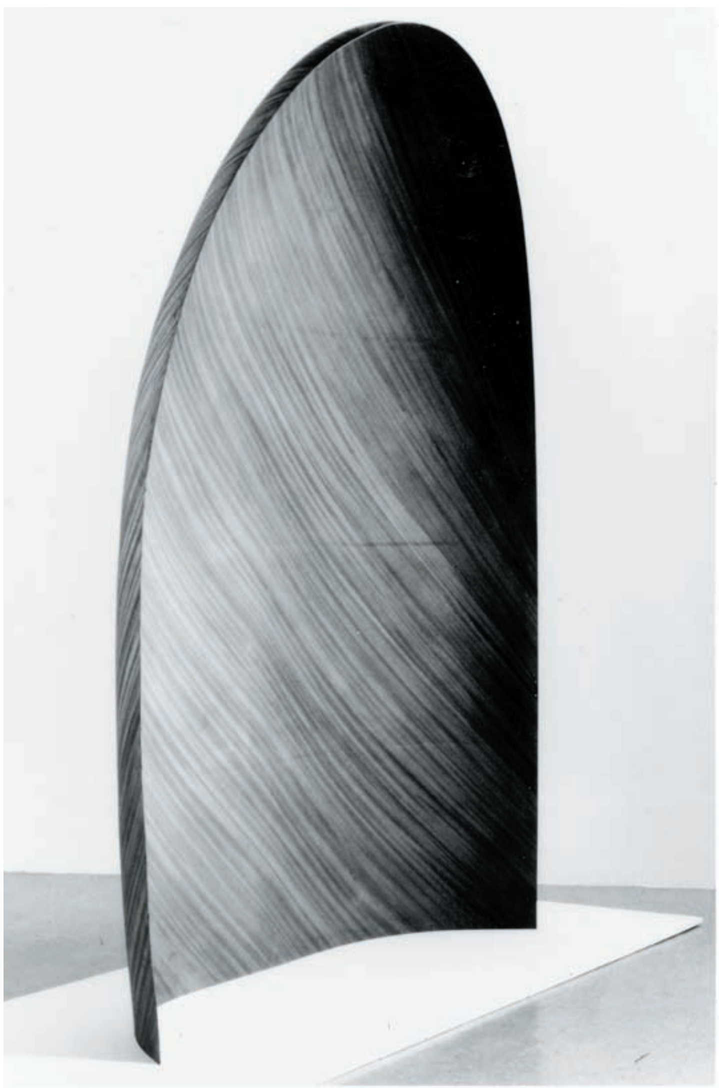


Figure 2. Ray and Charles Eames, **Study For A Glider Nose,** *1943. Molded Plywood and Mahogany Veneer. Collection Museum of Modern Art, New York. Gift of Lucia Eames Demetrios and Purchase.*

ble applications for the findings of the study and the prevalence of untreated wood as a material in modern and contemporary art.

Untreated wood is a material found in a wide variety of art objects in museum collections. In the context of this study, the word "untreated" signifies the absence of coatings such as paint, wax, varnish or any other protective coating on the surface of the wood. This paper examines a range of dry cleaning methods and materials already accepted by the conservation community as appropriate for cleaning paper, raw canvas and textiles, and will evaluate their appropriateness for cleaning untreated wood. These tested methods employ the basic principle of erasers, namely using an absorbent, malleable material to capture and contain foreign matter, including general soiling and surface accretions, which then acts as a vehicle for transporting the foreign matter away from the surface of the object.

The American sculptor Donald Judd first used untreated plywood as a material for sculpture in 1972 and was producing works with untreated plywood until his death in 1994. In addition to using plywood for sculpture and furniture, Judd also used it as a material to construct molds for works in concrete, intentionally producing a highly legible imprint of the plywood grain in his concrete sculptures. His early plywood pieces from the 1970s employed a special grade of Douglas fir[2] plywood called Marine Plywood.™[3] This exterior-grade plywood has significantly reduced voids in its interior plies, or layers, so that each ply is completely supported and voids are minimized when the panel is cut, resulting in cleaner looking cut edges. His later plywood works from the late 1980s and early 1990s used a higher, finish-grade plywood, creating an almost flawless plywood surface without voids and surface blemishes.

Although manufacturing techniques have improved, principally in making the processes continuous and automated, plywood manufacture still follows the same basic steps that were developed in the mid-19th century. The term plywood was adopted in 1919 by the Veneers Manufacturing Association in an effort to streamline the terminology for the material, which in the 19th century included scale board, pasted wood and built-up wood. Plywood is an assembly of either

Figure 3. (left) Cleaning materials: (clockwise from the top right hand corner) Chemical sponge, hard and soft Wishab sponges, three eraser blocks: (Magic Rub, Staedtler Mars and Art Gum), Kneaded eraser, Groom Stick molecular trap, Skum-X, and in the center, grated Magic Rub eraser crumbs.

Figure 4. Surrogate testing panels of Douglas fir Marine Plywood.

4 test areas per board (2 light, 2 dark)
14 test boards
56 total sample areas

1. *Magic Rub eraser block*
2. *Magic Rub eraser crumbs x-coarse*
3. *Magic Rub eraser crumbs coarse*
4. *Staedtler eraser block*
5. *Wishab sponge soft*
6. *Wishab sponge hard*
7. *Magic Rub eraser crumbs coarse with French polish*
8. *Kneaded eraser*
9. *Groom Stick molecular trap*
10. *Skum-X*
11. *Art Gum eraser block*
12. *Chemical sponge*
13. *Control I*
14. *Control II*

softwood or hardwood veneers bonded together under pressure with an adhesive. Typically the direction of the grain alternates between layers in order to impart tensile strength. Plywood is noted for its high strength-to-weight ratio, dimensional stability, resistance to splitting and ability to be molded into compound curves.[4]

Research Methodology and Analysis

The study evaluated a range of dry cleaning methods and materials which are already accepted conservation practice for the cleaning of paper, raw canvas and textiles. Materials and methods that were tested are recognizable as cleaning materials commonly used in the conservation field today (fig. 3). These included chemical sponge, hard and soft Wishab sponges, three eraser blocks (Magic Rub, Staedtler Mars and Art Gum), kneaded eraser, Groom Stick molecular trap, Skum-X and grated Magic Rub eraser crumbs. Both coarse and extra coarse Magic Rub eraser crumb sizes were evaluated for this study. It is important to note that this study did not focus on efficacy; tests were conducted with the assumption that all of the cleaning materials are effective.

To conduct preliminary cleaning tests, surrogate testing panels of Douglas fir Marine Plywood were obtained, and sample areas were defined in Mylar overlays. Four sample areas were defined for each cleaning material: two from light areas of the wood and two from dark areas of the wood (fig. 4). At the start of the study, there were two main concerns for applying these cleaning methods on untreated wood. First, there is a potential for a change in the overall surface gloss or sheen if the wood becomes abraded or burnished during the mechanical action of the cleaning. The second concern is the potential for residue of the cleaning product to be left embedded in the wood grain or surface cracks. This residue could either

Application of Magic Rub eraser crumbs

Cleaning with bristle brush

Cleaning with "French polish" rubber

Vacuum removal of residue

Figure 5. Method of application of the Magic Rub eraser crumbs.

cause direct discoloration by its presence or could stain and discolor the object as it ages and deteriorates over time. The study aimed to evaluate these factors in three ways: by using spectrophotometry, visual microscopy and ultraviolet fluorescence.

Figure 5 illustrates the method of application of the Magic Rub eraser crumbs. Please note that both a natural bristle brush and a French polish "rubber" were used as two varied application methods for the crumbs.

The French polish rubber was used as a more standardized substitute for a human hand, since eraser crumbs are often manipulated directly with a conservator's hand during a dry cleaning treatment.

Early on in the study it was clear that although the method of application would be consistent during the testing of various cleaning materials, the largest uncontrollable variable was the lack of quantitative means to measure and reproduce force of application. This parameter was essential to define in order to make the results of this study useable. To identify the range of force used during dry cleaning treatment, eight conservators from the conservation department at the Museum of Modern Art were asked to use the dry cleaning materials examined in the study on the stage of an analog scale. The eight conservators were not given any directions regarding method and were only asked to address a generic pencil line and fingerprints that were created uniformly on small, 1/8-inch plywood pan-

Figure 6. Digital video camera records the measurement of force exerted on the stage of the analog scale in 30-second sessions.

els. A digital video camera was used to document the force exerted on the stage of the scale in 30-second sessions (fig. 6).

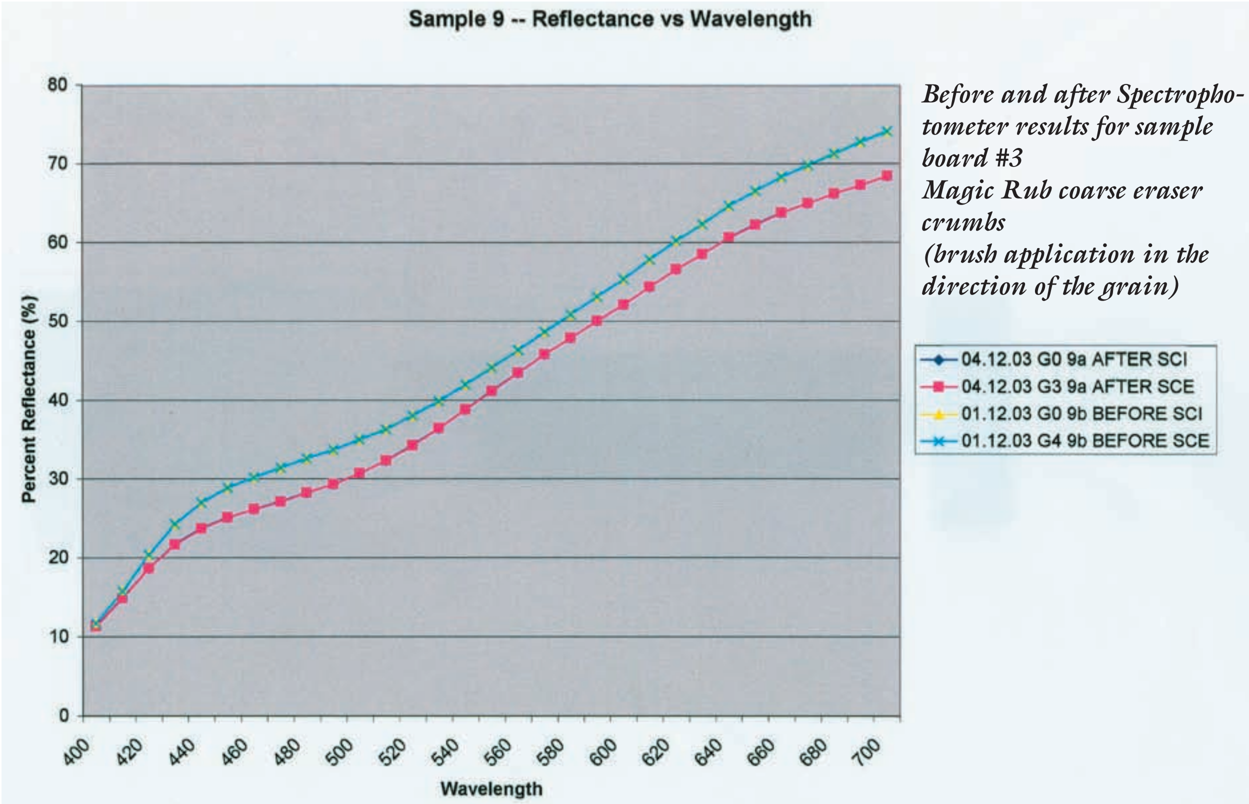
An approximated average force was calculated for each material and each conservator in order to determine a base line of reference for acceptable levels of force.[5] The findings indicated that the variation observed in different conservators is so large as to not be generalized. Also, the conservators used the cleaning materials in different ways. For example, some would clean with a small edge of an eraser block material, while others would use the entire surface of the eraser block, further preventing any overall general characterizations regarding general guidelines for force.

Spectrophotometer results showed that eight out of the 56 test areas had a slight decrease in percent reflectance. The remaining 48 test areas showed no appreciable change. From the eight test areas that did exhibit measurable change, it is not possible to correlate this with the type of wood or the physical character of the wood (fig. 7). These results are not conclusive and deserve more study. Possible causes can be attributed to removal of wood grain, compaction of wood grain, residues left by the cleaning materials and relative force of the cleaning method.

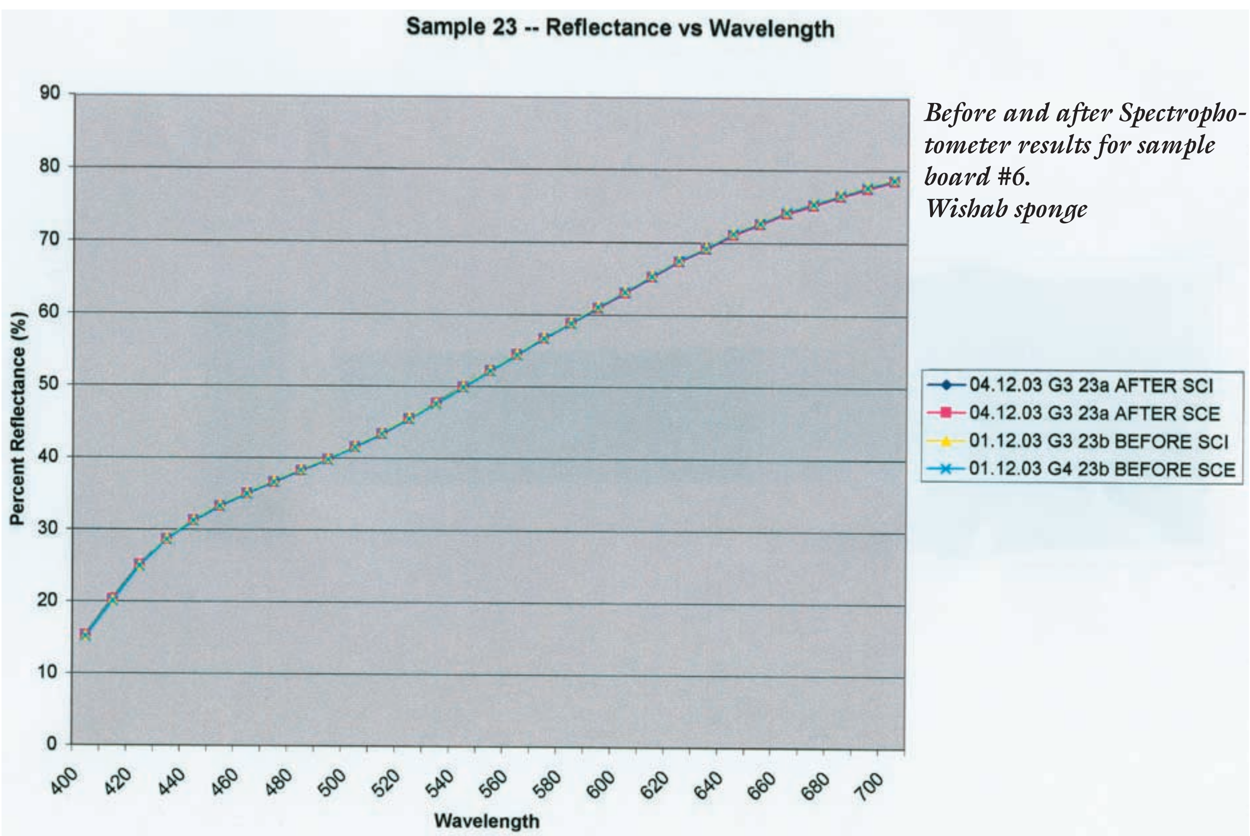
Before and after, photomicrographs using bright field, dark field, differential interference contrast and UV fluorescence were taken. What is notable when evaluating before and after photomicrographs is that there is no dramatic, visible change. Under 50x magnification, it is possible to observe surface fibers that may have been removed or compacted, but the type of change associated with an aqueous cleaning, for example, severely raised grain, is not evident.

Conclusion

This research shows that dry cleaning has minimal impact on reflectance, color change and surface morphology, certainly as compared with aqueous clean-



Before and after Spectrophotometer results for sample board #3
Magic Rub coarse eraser crumbs
(brush application in the direction of the grain)



Before and after Spectrophotometer results for sample board #6.
Wishab sponge

Figure 7.

ing methods. Out of the twelve cleaning methods evaluated in this study, seven showed a slight decrease in percent reflectance. However, when a slight decrease was observed, it was only for one out of the four test areas on a given sample board, and did not correspond to either a light or dark area of the wood. Therefore, we are unable to identify one method or material as superior or more appropriate. Lastly, it appears that force, considering the huge range of force exerted by different conservators, is a significant factor in evaluating these, or any cleaning method.

The results of the study are dependent on such factors as the cleaning product, method of application, as well as the type of wood. For example, the issue of residue and abrasion is more of a concern for soft woods and veneers. Due to the experimental difficulties in standardizing the tests, results can only be used in a general way at this time. Damage to the fiber of untreated wood is inevitable during most dry cleaning treatments, so it is important to control this factor by performing a few simple tests and observing the results under a low-power microscope. Although general results on the use of dry cleaning were successful, care needs to be taken to address the hardness of the eraser in relation to the fragility of the wood. Future studies might include the use of Scanning Electron Microscopy (SEM) or Gas Chromatography/Mass Spectrometry (GC/MS), as well as the evaluation of these dry cleaning methods on other hard or soft woods to further substantiate results.

Endnotes

1. AIC annual conference, 1999, St. Louis, MO.

2. *Pseudotsuga menziesii*. Western Wood Products Association, www.wwpa.org.

3. Hoadley.

4. Jester.

5. The approximated levels of force were calculated for each cleaning material and for each conservator by reviewing the video-taped readings from the analog scale and by correlating this with the surface area of the cleaning material in contact with the test panel.

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Acknowledgements

We would like to thank both Jim Coddington, Agnes Gund Chief Conservator at the Museum of Modern Art, and Chinati's Director, Dr. Marianne Stockebrand for making this conservation collaboration possible. We also greatly benefited from the assistance of Christopher McGlinchy, Conservation Scientist at MoMA, and the analytical equipment made available to us there. And very special thanks are due to Agnes Gund, for her generous support of this study.

Biography

Francesca Esmay received her training in Architectural and Monument Conservation at Columbia University and was awarded a Masters of Science in 2001. Prior to her graduate studies, Ms. Esmay obtained extensive experience in the field of object conservation through internships in the sculpture conservation departments of the Museum of Modern Art, the Metropolitan Museum of Art and the Donald Judd Estate in Marfa, Texas. Ms. Esmay received additional training in the field of Architectural Conservation at Integrated Conservation Resources, a private, architectural conservation consultant in New York, and at the Landmarks Preservation Commission, the New York City agency which designates and regulates historic districts, landmarks and monuments. Ms. Esmay began working at the Chinati Foundation in July of 2001 as the museum's first conservator.

Roger Griffith has been an Associate Sculpture Conservator for the Museum of Modern Art, New York, since 1998. He received a MA from the Royal College of Art / Victoria & Albert Museum Conservation Program in 1997, after having completed an internship in furniture conservation at the Metropolitan Museum of Art's Sherman Fairchild Center for Objects Conservation, New York. He was a Samuel H. Kress Fellow at the Stedelijk Museum Amsterdam in 1997 before accepting his position at MoMA.