Article: Research on Methods of Cleaning Face-Mounted Photographs
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RESEARCH ON METHODS FOR CLEANING FACE-MOUNTED PHOTOGRAPHS

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ABSTRACT

As part of the Global Face-Mounting Initiative, Photograph Conservation at The Metropolitan Museum of Art investigated the effects of various cleaning methods on the poly(methyl methacrylate) surface of face-mounted photographs. Samples of face-mounted photographs were cleaned regularly and the effects on the photograph's surfaces were evaluated qualitatively and documented with photomicrographs. Results demonstrate that all contact cleaning methods cause some abrasion of the poly(methyl methacryle) surface. A preliminary test of an anti-static ionizing gun is also presented.

1. INTRODUCTION

Photographs face-mounted to poly(methyl methacrylate) (PMMA) have posed several new challenges to photograph conservators. PMMA, commonly known as acrylic or *Plexiglas*®, collects dust and dirt, but cleaning this sensitive plastic has proven to be a complex issue. PMMA surfaces scratch easily and the use of inappropriate solvents and cleaners may cause micro-crazing. In order to better understand the issues involved in the conservation of these photographs, conservators and scientists began an international collaborative research effort, known as the Global Face-Mounting Initiative. As part of the Initiative, Photograph Conservation at The Metropolitan Museum of Art began a long-term study on the cleaning of face-mounted photographs in January 2006. The study tested the use of various wet and dry cleaning methods to remove dust from samples of face-mounted photographs on a regular basis. The study was intended to mimic cleaning methods carried out in a museum environment in real time. Data from the study has aided in developing guidelines for cleaning face-mounted photographs on display at The Metropolitan Museum of Art.

2. BACKGROUND

The face-mounting technique was first used by artists in the mid-1970s and rose to widespread popular use in subsequent years. A face-mounted photograph consists of a PMMA sheet adhered directly to the emulsion (face) of a photograph, often a chromogenic print. The adhesive used is usually proprietary, but is often a type of silicone sealant or pressure sensitive acrylic adhesive. Prints may also be mounted on the reverse to a solid support such as aluminum or *Dibond*®.

Face-mounting has become popular among contemporary photographers for several reasons. Photographic binder, silicone rubber adhesive, and PMMA all have very similar refractive indexes, so there is little reflection and refraction of light at the interfaces between these materials. This results in colors appearing deeper and more saturated in face-mounted photographs (Pénichon and Jürgens, 2001). The PMMA layer also allows for a minimum of framing and no additional glazing, lending a sense of immediacy to the photograph that is not possible with a print matted and framed in the traditional manner. Face-mounting a photographic print also creates a flat and rigid object that is in many ways easier to handle than a traditional photograph, especially if the photograph is in a very large format.

Fig. 1. *Face-mounted photograph by Thomas Ruff on display in the Joyce and Robert Menschel Hall for Modern Photography at The Metropolitan Museum of Art*

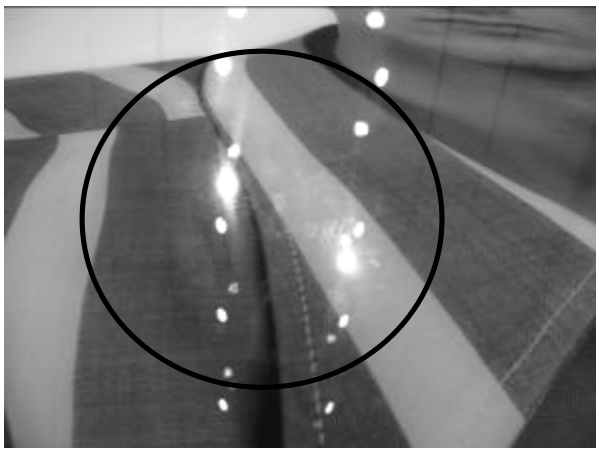


Fig 2. *Detail of fingerprints on the surface of Thomas Ruff's "Portrait (A. Siekmann)" face-mounted photograph (Acc.# 1999.210)*

As with other contemporary art works made using new materials or techniques, conservators have questions about appropriate treatment methods for face-mounted photographs. Unlike the glazing in a frame, the PMMA in a face-mounted photograph is an integral part of the artwork and cannot be easily replaced. Therefore, the methods that have been used to clean the acrylic glazing in a traditionally framed artwork may not be appropriate for use on the acrylic surface of an art object.

3. GLOBAL FACE-MOUNTING INITIATIVE AT THE METROPOLITAN MUSEUM OF ART

The Global Face-Mounting Initiative was established in 2004 to conduct loosely collaborative research with the goal of developing sound guidelines for the preservation and conservation of face-mounted photographs. Bill Wei of the Netherlands Institute for Cultural Heritage is currently coordinating the project that involves photograph conservators in private practice and within institutions primarily based in Europe and North America.

The Metropolitan Museum of Art is participating in the Initiative by determining appropriate cleaning methods for face-mounted photographs. This is of particular importance since face-mounted photographs are usually displayed without additional protective glazing, making them susceptible to collecting dust, fingerprints and other accretions while on exhibition. The surface of PMMA is very sensitive to abrasion, so cleaning runs the risk of scratching the delicate surface, and the use of many liquid cleaners and solvents is considered risky, as they may cause internal stresses and crazing of the plastic.

Much of the research available on PMMA is from our colleagues in objects conservation. In his 1993 article, "An evaluation of eleven adhesives for repairing poly(methyl methacrylate) objects and sculpture," Don Sale noted that only two solvents typically used by conservators are safe for use on PMMA, water and petroleum (mineral) spirits (Sale, 1993). Sale noted that ketones, such as acetone, would likely swell or dissolve PMMA, while aliphatic alcohols like ethanol and isopropanol would likely cause crazing. Aliphatic hydrocarbons would also likely cause crazing of PMMA on long-term exposure. It is important to note that damage caused by solvent exposure is not always immediately visible. While cracking and crazing may not be initially present, the PMMA may be stressed by solvent contact, making it more vulnerable to subsequent solvent exposure.

Even though water has been presented as an appropriate solvent for use on PMMA, moisture absorption has also been noted to cause crazing of PMMA sheets under extreme conditions of cycling (Van Oosten, 2002).

4. EXPERIMENTAL DESIGN

In order to learn about the long-term effects of wet and dry cleaning methods on PMMA, Camille Moore, then a graduate student at the New York University graduate conservation program, established a long-term cleaning experiment in Photograph Conservation at the Metropolitan Museum in January 2006. The study has continued for several years with the help of Metropolitan Museum volunteers, interns and fellows. At the date of publication the samples had been cleaned 65 times over a two and a half year period.

The following cleaning materials (*Table 1*) were chosen from a master list developed by members of the Global Face-Mounted Initiative. The choice of materials was also guided by the results of other studies, most notably by Erin Murphy (Murphy, 2007). Museum technicians were also interviewed about commercial cleaning products they commonly use on acrylic glazing.

Table 1. *Cleaning methods included in the test*

DRY CLEANING MATERIALS
Chamois cloth
Cyber Fabric™ cloth
Cotton cloth
Hake brush
Kinetronics StaticWisk™ antistatic brush
Kinetronics StaticWisk™ with grounding cord
Kinetronics Panther™ microfiber cleaning cloth
Modern Magic Blue Suede™ microfiber cleaning cloth
Sunglasses Giant Deluxe Miracle™ lens cleaning cloth
TAP™ microfiber cleaning cloth
WypAll X-70™ cloth

WET CLEANING MATERIALS	
CLOTH	**SOLVENT**
Chamois	Deionized water
Kinetronics Panther™	*Kinetronics Precision* ™ glass cleaner
TAP™ microfiber	Acetone
TAP™ microfiber	*Brillianize Plastic Cleaner and Polish*™
TAP™ microfiber	Deionized water
TAP™ microfiber	*Gamsol*™ mineral spirits
TAP™ microfiber	*Kodak Photo-Flo*™ 1:200 in water
TAP™ microfiber	*Kinetronics Precision*™ glass cleaner
TAP™ microfiber	*Novus #1 Plastic Cleaner and Polish*™
TAP™ microfiber	Reagent alcohol
TAP™ microfiber	*Sparkle*™ glass cleaner

A variety of dry cleaning methods were tested, including traditional materials, like Hake brushes and cotton cloths, and newer materials, like antistatic brushes and several microfiber cloths. Microfiber is known for its softness and many manufacturers claim that the fibers actually trap dirt, so it was hoped that these cloths might produce fewer scratches during cleaning, since the cloth would trap the dirt instead of dragging it across the PMMA surface.

The wet cleaning tests also included a variety of materials, including those that are known to be harmful to PMMA, in order to represent extremes. The majority of these cleaners were applied with the same type of cloth. The *TAP*™ cloth was chosen as it performed well in Erin Murphy's initial dry cleaning tests (Murphy, 2007). The *Panther*™ cloth combined with the *Kinetronics Precision*™ glass cleaner was included since this combination is sold commercially as a cleaning system.

Fig. 3. *Samples placed on ledge in the photograph conservation laboratory, The Metropolitan Museum of Art*

Fig. 4. *Left side of sample is covered while right side is cleaned with the various systems*

Samples of face-mounted photographs were obtained from Bill Wei at the Netherlands Institute for Cultural Heritage in Amsterdam. The specimens were chromogenic prints printed on *Laserchrome*® paper and were face-mounted using the *Diasec*® process by Grieger GmbH in Düsseldorf, Germany. A black and white image was selected for better visual evaluation of surface characteristics, including the accumulation of surface debris, as well surface abrasion.

The samples were placed on a ledge in the photograph conservation lab and left to collect dust, though in practice little dust settled on them (*Fig. 3)*. They were cleaned according to a standardized procedure approximately two to three times per month. Half of the photograph was protected with a mat board mask, to retain as a control, while the other half was cleaned (*Fig. 4*). For dry cleaning, the surface was wiped with the cloth or brushed six times top to bottom. For wet cleaning, the cloth was sprayed with the solvent or cleaner six times. The damp cloth was then used to wipe the surface from top to bottom four times and then wiped with a dry portion of the cloth twice to remove any residual solvent or cleaner.

5. OBSERVATIONS

The samples were evaluated by visual observation under magnification and were documented with photomicrographs using a 25X objective. Although this method did not provide quantitative results, it is clear which cleaning systems produced the greatest damage.

All dry cleaning methods caused some abrasion (*Table 2*). The *Modern Magic Blue Suede*™ microfiber cloth and the dry chamois caused the least amount of scratching. The *Modern Magic* cloth caused fewer scratches than the *TAP*™ microfiber cloth, which had performed well in Erin Murphy's initial research. The most scratches occurred with the *Cyber Fabric*™, the *WypAll*™ cloth, and both *Kinetronics*™ anti-static brushes. The Hake brush, commonly trusted to be safe for delicate surfaces, also caused considerable abrasion.

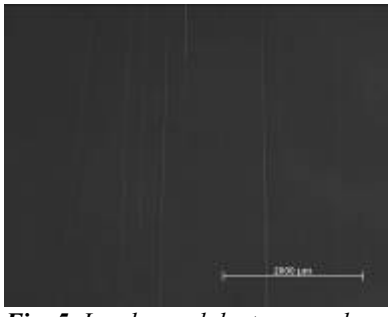
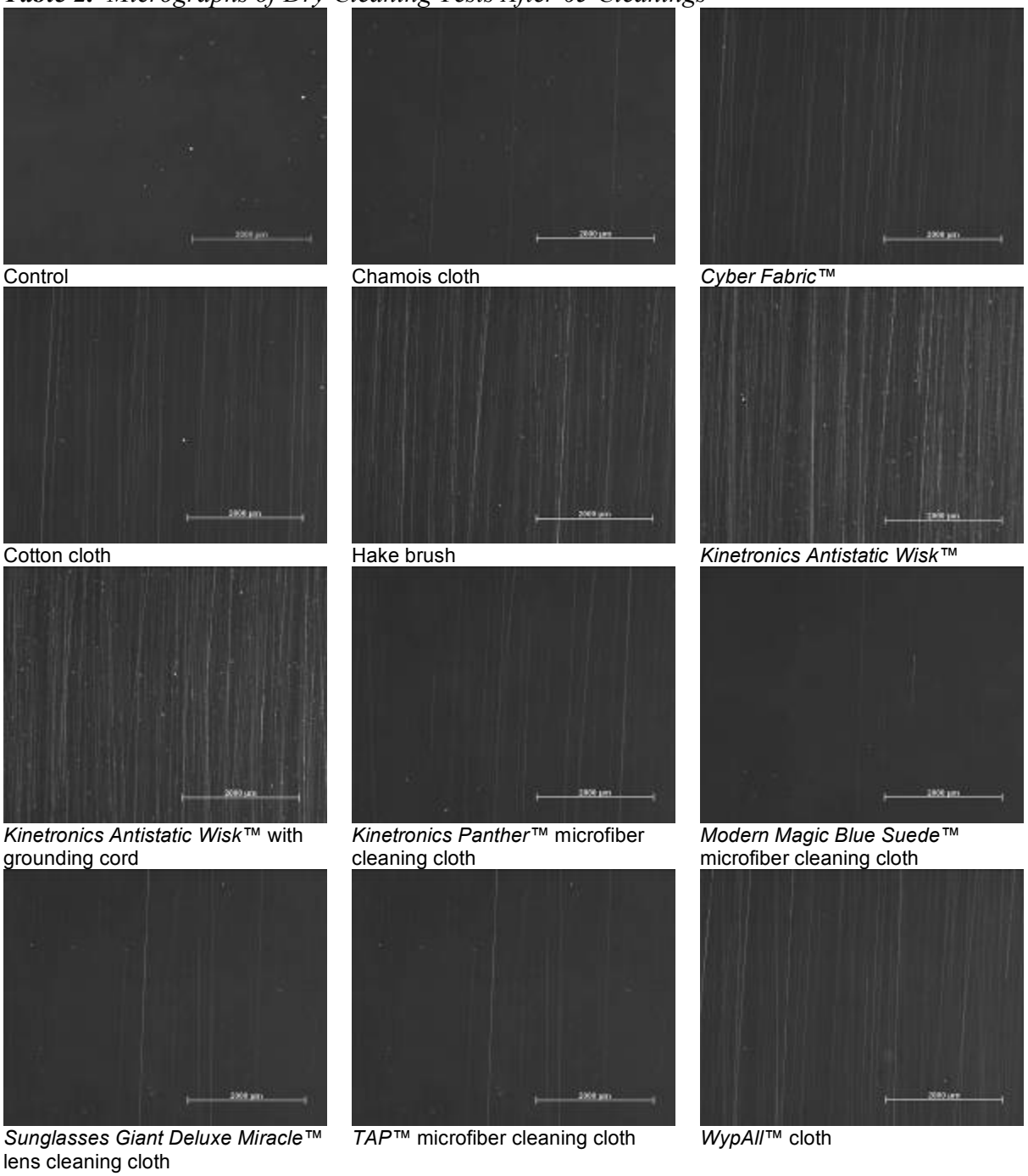


Fig. 5. *Lambswool duster sample micrograph after 10 cleanings*

After Erin Murphy's publication of her research results in 2007, a sample cleaned regularly with a lambswool duster (found to be the most acceptable contact dry cleaning method in Murphy's study) was included in this test. The sample also shows scratching after 10 cleanings (*Fig. 5)*.

Table 2. *Micrographs of Dry Cleaning Tests After 65 Cleanings*



Control | Chamois cloth | *Cyber Fabric*™

Cotton cloth | Hake brush | *Kinetronics Antistatic Wisk*™

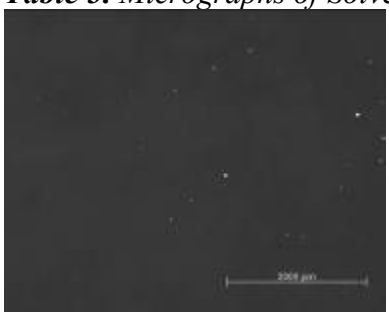
Kinetronics Antistatic Wisk™ with grounding cord | *Kinetronics Panther*™ microfiber cleaning cloth | *Modern Magic Blue Suede*™ microfiber cleaning cloth

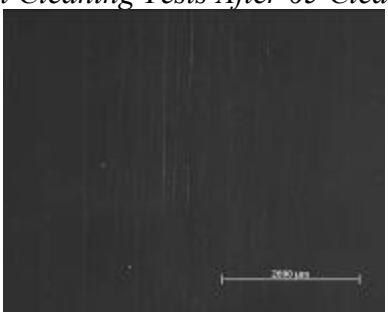
Sunglasses Giant Deluxe Miracle™ lens cleaning cloth | *TAP*™ microfiber cleaning cloth | *WypAll*™ cloth

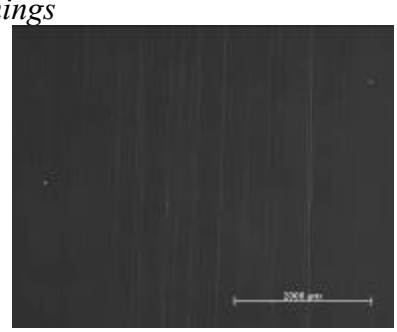
Wet cleaning methods were overall less damaging to the photographs than the dry cleaning methods. Nonetheless it is possible to observe scratches in all the samples (*Table 3*). Fewer scratches were caused by the use of *TAP*™ microfiber cloth with *Brillianize Plastic Cleaner and Polish*™ and the *TAP*™ cloth with *Novus #1 Plastic Cleaner and Polish*™. Despite their positive results in this test, these products cannot be endorsed for cleaning face-mounted photographs as they contain proprietary materials, as well as abrasive polishing particles. The long-term effects of these materials are unknown. The use of chamois with water resulted in the appearance of streaks, but this could possibly be minimized by changing the application method.

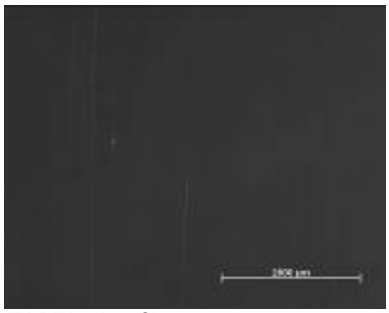
Although we do not endorse their use, it was found that the aggressive methods (acetone, reagent alcohol, proprietary glass cleaners, etc.) have not yet shown the expected damage, such as dissolution or crazing of the poly(methyl methacrylate).

Table 3. *Micrographs of Solvent Cleaning Tests After 65 Cleanings*

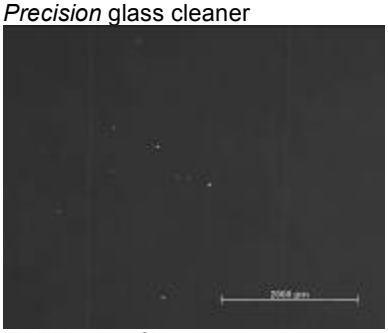

Control

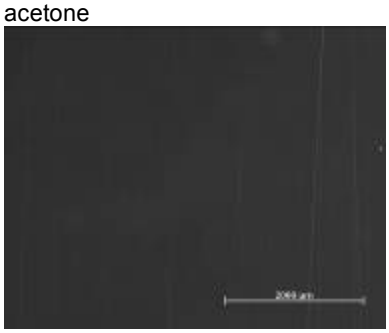

Chamois cloth + w

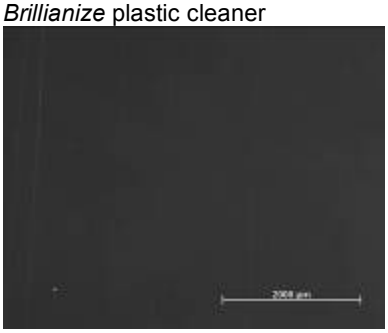

Kinetronics Panther™ cloth + *Precision* glass cleaner

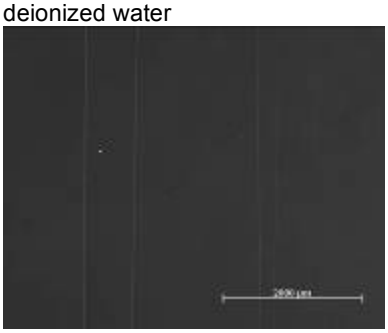

TAP™ microfiber + acetone

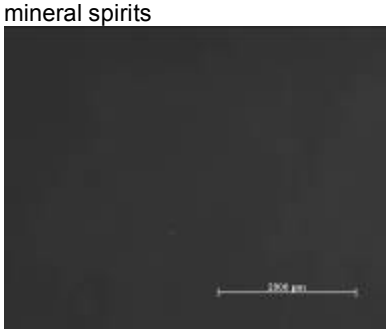

TAP™ microfiber + *Brillianize* plastic cleaner

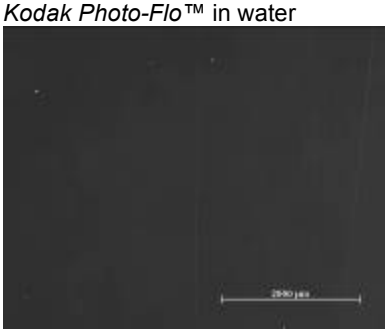

TAP™ microfiber + deionized water

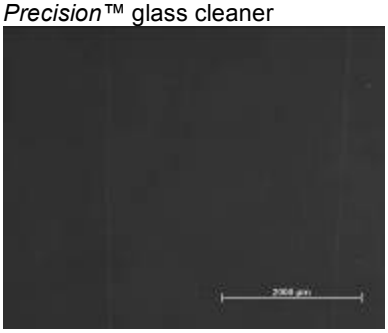

TAP™ microfiber + mineral spirits


TAP™ microfiber + *Kodak Photo-Flo*™ in water


TAP™ microfiber + *Precision*™ glass cleaner


TAP™ microfiber + *Novus #1*™ plastic cleaner


TAP™ microfiber + reagent alcohol


TAP™ microfiber + *Sparkle*™ glass cleaner

6. ADDITIONAL TESTING: ROUGHNESS MEASUREMENTS

Selected samples were sent to Bill Wei at the Netherlands Institute of Cultural Heritage (ICN) for roughness measurements using a confocal profilometer (μSurf from NanoFocus). These

measurements will provide quantitative results in the future. No results were available at the time of submission of this article.

7. ADDITIONAL TESTING: ANTI-STATIC IONIZING GUN

The use of an anti-static ionizing gun has also been suggested as a possible efficient and safe cleaning method (Murphy, 2007). This device uses an ionization process that converts surface particles into neutral ions by adding or removing charged electrons or excess ions. This breaks the static bond between an object's surface and accumulated debris. The anti-static gun is attached to a compressed air source. The airflow passes through the gun's ionizing point and then neutralizes the surface of the statically charged object. In the course of this research, a 190HP gun from *Electrostatics* was informally tested (*Fig. 6-8*).

Fig. 6. *Measuring static on face-mounted photograph*

Fig. 7. *Anti-static ionizing gun (190 HP from Electrostatics) attached to air compressor*

Fig. 8. *Using the anti-static ionizing gun to clean a face-mounted sample*

Tests were performed on dusty samples, and an air brush compressor was used as an air source. When a low airflow was applied, debris was not removed completely from the samples. Turning the ionizing function of the gun on and off produced identical results, indicating that the anti-static component offered no advantage.

Another attempt was made to slowly neutralize the surface by blowing the ionizing airflow on the sample for a period of 5 minutes. Again, this had identical results to use of continuous airflow with the gun's anti-static function turned off. The use of a higher level of air pressure was more efficient in removing the surface dust due to the physical strength of the airflow. Debris that was not removed with the gun could be easily removed with an air bulb.

It is likely that there is not a great amount of static tension on a surface of a face-mounted photograph and, therefore, the use of anti-static guns is not an efficient method for cleaning these objects. An informal measurement of the surface static electricity of Thomas Ruff's "Portrait (A. Siekmann)" with a static meter produced a reading of 0.1 Kv, a very low value in comparison to 0.2 Kv on a common acrylic glazing, and 2.8 Kv on the surface of an acrylic display case.

8. CURRENT CLEANING PROCEDURE FOR FACE-MOUNTED PHOTOGRAPHS ON DISPLAY AT THE METROPOLITAN MUSEUM OF ART

The cleaning procedure for face-mounted photographs at The Metropolitan Museum of Art has benefited from Erin Murphy's previous research as well as the research presented in this article. The opening of the Joyce and Robert Menschel Hall for Modern Photography in 2007

has resulted in an increase in the exhibition of face-mounted works at The Metropolitan Museum of Art and an increased need for satisfactory cleaning methods.

Based on the current evidence, the cleaning protocol followed at MMA limits surface contact as much as possible. The first step is to remove the surface dust overall with an air bulb, taking great care not to touch the surface with the plastic nozzle. Fingerprints and accretions are cleaned locally with a microfiber cloth slightly humidified by spraying with de-ionized water. On certain occasions, such as at the end of an exhibition, the surface dust accumulation has been too great to remove with merely an air bulb. In these cases, a *Modern Magic Blue Suede*™ cloth is used to clean the surface overall. The cloth's outer seams are trimmed, and the cloth is rolled and swiped in a downward motion, applying very slight pressure. The cloth is periodically turned and refolded to ensure that a clean portion is used at all times. However, the general policy is to reduce cleaning to a minimum and restrict cleaning to local areas whenever possible.

9. CONCLUSIONS

All of the tested cleaning methods caused some effect that may cause concern for conservators. We will continue with this real-time test and will also continue conducting profilometry (roughness) measurements to obtain quantitative results. The air bulb is still the safest method to remove dust from the surface of face-mounted photographs. There is no ideal method to reduce accretions and fingerprints, since all systems involve contact with the surface, which always causes abrasion.

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SOURCES OF MATERIALS

Acetone 99+% Extra-Pure: Acros, www.acros.com

Brillianize Plastic Cleaner and Polish: Brillianize, Inc., www.brillianize.com

Cyber Fabric™: Avaiable from Modern Solutions Inc., www.modernsolutionsinc.com

Histological Grade Reagent Alcohol, Fischer A962F: Fisher Scientific, www.fishersci.com

Kinetronics StaticWisk©, Kinetronics StaticWisk© with grounding cord, Kinetronics Panther microfiber cleaning cloth, and Kinetronics Precision Glass Cleaner: Kinetronics, Co., www.kinetronics.com

Modern Magic Blue Suede microfiber cleaning cloth: Modern Plastics, www.modernplastics.com/

Gamsol Odorless Mineral Spirits: Gamblin Artists Colors, www.gamblincolors.com

Novus #1 Plastic Cleaner and Polish: Novus Inc., www.novuspolish.com/

Kodak Photo-Flo 200 Solution: Kodak, www.kodak.com/

Sparkle Glass Cleaner: A.J. Funk & Co., www.glasscleaner.com/

Sunglasses Giant Deluxe Miracle lens cleaning cloth: Sunglasses Giant, www.sunglassesgiant.com/

TAP microfiber cleaning cloth: TAP Plastics, www.tapplastics.com

WYPALL X70 Wipers:* Kimberly-Clark Corp., www.kcprofessional.com/

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