Article: Problems and methods of cleaning: Practical examples of the cleaning of wooden objects from Egypt
Author(s): Hany Hanna Aziz Hanna and Neveen Atef Meshrieky Meleka
Source: Objects Specialty Group Postprints, Volume Eleven, 2004
Pages: 71-88
Compilers: Virginia Greene and Patricia Griffin
© 2007 by The American Institute for Conservation of Historic & Artistic Works, 1156 15th
Street NW, Suite 320, Washington, DC 20005. (202) 452-9545
www.conservation-us.org

Under a licensing agreement, individual authors retain copyright to their work and extend publications rights to the American Institute for Conservation.

Objects Specialty Group Postprints is published annually by the Objects Specialty Group (OSG) of the American Institute for Conservation of Historic & Artistic Works (AIC). A membership benefit of the Objects Specialty Group, Objects Specialty Group Postprints is mainly comprised of papers presented at OSG sessions at AIC Annual Meetings and is intended to inform and educate conservation-related disciplines.

Papers presented in Objects Specialty Group Postprints, Volume Eleven, 2004 have been edited for clarity and content but have not undergone a formal process of peer review. This publication is primarily intended for the members of the Objects Specialty Group of the American Institute for Conservation of Historic & Artistic Works. Responsibility for the methods and materials described herein rests solely with the authors, whose articles should not be considered official statements of the OSG or the AIC. The OSG is an approved division of the AIC but does not necessarily represent the AIC policy or opinions.
PROBLEMS AND METHODS OF CLEANING: PRACTICAL EXAMPLES OF THE CLEANING OF WOODEN OBJECTS FROM EGYPT

Hany Hanna Aziz Hanna and Neveen Atef Meshrieky Meleka

Abstract

Much attention has been given to the treatment and conservation of some objects in churches, mosques and museums in Cairo, Egypt. Some of these objects are made of wood, including teak, cedar and pine, and are decorated with geometric patterns such as stars with animals, birds and floral designs as well as calligraphic inscriptions. They show a variety of techniques of construction and decoration, including paneling or joinery, gilding, painting, staining with shellac, incision and engraving and inlay with materials such as ivory, bone, shell and ebony.

These objects have been examined by scanning electronic microscopy (SEM), light microscopy, x-ray diffraction and IR spectroscopy (FTIR). Relative humidity, temperature, air and microbial pollution of the surrounding environment were also studied.

The different materials used in the manufacture and decoration of the objects displayed various forms of deterioration, resulting from the combined effect of environmental factors such as air pollution and relative humidity, etc. The deterioration includes (a) a high degree of soiling by particulate matter such as heavy dust and black carbon soot, mostly deriving from atmospheric pollution; (b) extensive alteration of original materials with lime plaster, plastic and oil paint, old paper of poor quality adhered with gum Arabic, and the use of modern nails; (c) damage by the modern application of coating materials that have undergone weathering.

In this paper the techniques used to recognize and identify the nature of these alterations, as well as the methods and the materials used for cleaning some of these objects, will be described.

1. The objects

Much attention has been given to the treatment and conservation of objects in churches, mosques and museums in Cairo, Egypt. Some of these objects are made of wood, including church sanctuary screens (*iconostasis*, pl. *iconostases*), *mashrabiyya* (wooden grilles used to cover windows or balconies), furniture, painted wood and structural timber. The screens, furniture and wood panels may display a variety of joints and include lathe-turned elements, incised or engraved designs, gilding, painting, staining with shellac and inlay.

Many of the objects are composed of numerous small interlocked pieces of wood. The designs include geometric patterns such as stars (see Figs. 18, 19) and crosses (Fig. 27) as well as animals, birds, floral designs and calligraphic inscriptions.

Identified species of wood include teak (*Tectona grandis*), cedar (*Cedrus libani*), sidder (*Zizyphus spina-christi*), oak (*Quercus robur*), beech (*Fagus orientalis*), sycamore fig (*Ficus*...
sycamorus) and pine (e.g. *Pinus halepensis*). Inlaying materials include ivory, bone, shell (mother of pearl) and ebony.

2. Deterioration

The different materials used in the manufacture and decoration of the objects displayed various forms of deterioration, resulting from the combined effect of environmental factors such as air pollution, relative humidity, rain fall and precipitation, heat, light, fire, water, insects, fungi, rodents and birds.

In addition to breakage, cracks, holes, cavities, gaps, corrosion, abrasion, loose and lost pieces, the deterioration includes disfiguration and alteration caused by surface accumulation of particulates as well as old repairs, including:

1. A great deal of soiling by particulate matter such as heavy dust and black carbon soot, mostly deriving from atmospheric pollution.

2. Extensive alteration by human intervention, including restoration with lime plaster, cement, acrylic and oil paint, old paper of poor quality that had been adhered with gum Arabic, and modern nails.

3. Damage by the modern application of coating materials that have undergone weathering.

Examples of dirt accumulation and alterations are shown in Figs. 1-4.

Figure 1. Detail shows some disfiguration on the sanctuary screen (iconostasis) from the central sanctuary, dedicated to the Virgin Mary, at *El-Muallaga* Church, Cairo [1].
Figure 2. Detail shows the high degree of soiling by particulate matter on one of the screens (mashrabiyya) in the El-Amir Bashtak palace.

Figure 3. Detail of damage to mashrabiyya No. 2979 in the Museum of Islamic Art in Cairo.

Figure 4. Detail of alteration on painted panels of the Mar Bahnam sanctuary at Mar Mena church in Cairo.
3. Testing and analytical work

Examination and testing have included the following:

1. Identification of wood and inlay materials using light microscopy. For example, teak wood (Tectona grandis) sections are shown in Figures 5-6.

2. Scanning Electron Microscopy (SEM) showed damage to the surface layer of wood (which now appears white in color, see Figs. 7-8) as well as dirt which has accumulated in the fibers of the wood.

3. Wood samples showing evidence of fungal attack were placed in growth media in an attempt to identify the fungi. Two different species of soft rot fungi were obtained, one of which is Phialophora verrucosa (Fig. 9).

4. X-Ray diffraction together with examination using a mineralogical microscope have demonstrated that the deposits included carbon (C), calcite (CaCO₃), dolomite (CaMg (CO₃)₂), gypsum (CaSO₄·2H₂O) and quartz (SiO₂); and that the pigment minium (Pb₃O₄) had been used to coat the wood (Figs. 10-11).

5. Infra-red spectroscopy analyses (FTIR) was used to identify the various materials that caused stains and spots, such as gum Arabic, animal glue, oils and waxes, and demonstrated that animal glue was used as the binding material for pigments and as the adhesive for the inlays. Examples of waxes and waxy substances are shown in Fig. 12.

6. Temperature and relative humidity were recorded during 2003 in the areas surrounding many objects. The records demonstrated that the average variation in temperature over the year was 2-10 degC, and the change in RH 2-11%. These fluctuations are large enough to cause damage to the wood.

Figure 5 (left), 6 (right). Light microscopy photomicrographs of cross-section (Fig. 5) and longitudinal-section (Fig. 6) of teak wood (Tectona grandis) (x50).
Figure 7. Scanning Electron Microscopy photo of cross-section of pine wood showing the damage in the xylem parenchyma and the dirt that accumulated in the wood (x500).

Figure 8. Scanning Electron Microscopy photo showing the damage to the surface layer of the wood, dirt and salt crystals (x500).
Figure 9. Photomicrograph of *Phialophora verrucosa* fungus (x1000).

Figure 10. The x-ray powder diffraction analysis of the dirt from the surface of the wood.
Figure 11: The dirt as it appears under the mineralogical microscope (x125).

Figure 12. Infrared Spectroscopy analyses for some alternation from the surface of the wood (A), compared with waxes and waxy substances (B).
4. Cleaning

The aim of the cleaning work in general was to remove the dirt and the surface alterations. Specifically, the intent was to removing any dirty or unsuitable non-original coating layer, and to expose any additional non-original layers as well as original paintings and/or inscriptions. The work sometimes proceeded slowly because of the poor condition of the wood, and also to ensure that no original paint was removed.

Cleaning was carried out first by mechanical means, with use of organic solvents as needed, depending on the type of material to be cleaned, the condition of the substrate and the nature of the material to be removed. Methods and materials varied might also vary from the front to the back of the object.

Modern nails were removed using a claw hammer.

Easily removable surface dust was removed with soft brushes and a vacuum cleaner.

Paper, lime plaster, acrylic and oil paint, soot, and damaged coating materials were removed with fine tools such as needles, spatulas, and scalpels, together with electrically powered needlepoints.

The following chemicals were used as needed:

1. 1% acetic acid (CH₃ COOH) in water, which was useful in removing both the gum arabic and acrylic paint.

2. Dimethyl formamide (H-CO-N (CH₃)₂) was used to remove the oil paint.

3. Tetralin (tetrahydronaphthalene C₁₆H₁₂) was used to remove the black carbon soot.

The cleaning work led to the discovery of some previously unknown details. In the case of one church screen (iconostasis), for example, it was necessary to remove the planks affixed to the backs of the screen to clean it. When this was done it was possible to see marks that had been used as guides in the assembly of the decorative pieces (Fig. 19).

Examples of some of the cleaning processes (before, during and after) are shown in Figures 13 - 29.
Figure 13. Central sanctuary screen (iconostasis) at El-Muallaqa Church in Cairo, before the cleaning, restoration and conservation work.

Figure 14. Central sanctuary screen, El-Muallaqa Church, during the cleaning, restoration and conservation work (the right half of the screen has been cleaned).
Figure 15. Central sanctuary screen, *El-Muallaga* Church, after cleaning, restoration and conservation work.

Figure 16. Detail shows part of the central sanctuary screen, *El-Muallaga* Church, before cleaning.
Figure 17. Area shown in Fig. 16, during cleaning.

Figure 18. Area shown in Figs. 16 and 17, after cleaning, restoration and conservation work.
Figure 19. Signs to guide the joiner in assembling the decorative pieces were discovered on the back of the central sanctuary screen from *El-Muallaqa* Church.

Figure 20: The sanctuary screen (iconostasis) from the St. John the Baptist sanctuary, *El-Muallaqa* Church, before the cleaning, restoration and conservation work.
Figure 21. St. John the Baptist sanctuary screen after the cleaning, restoration and conservation work.

Figure 22: Detail shows part of the St. John the Baptist sanctuary screen before cleaning.

83
Figure 23. Area of screen shown in Fig. 22, during the first step in the cleaning process.

Figure 24. Area of screen shown in Fig. 23, during the second step in cleaning.
Figure 25. Area of screen shown in Figs. 22-24, after the cleaning, restoration and conservation work.
Figure 26 (left). Another area of the sanctuary screen shown in Fig. 21, before conservation.

Figure 27 (right). Area of screen shown in Fig. 26, after the cleaning, restoration and conservation.
Figure 28. Detail showing part of *mashrabiyya* No. 2979 in the Museum of Islamic Art in Cairo, before cleaning (cf. Fig. 3).

Figure 29. Detail of *mashrabiyya* No. 2979, after cleaning.
Acknowledgments

The author is grateful to Prof. (Dr.) Yassien El Sayed Zidan, Department of Restoration, Faculty of Archaeology, Cairo University, and Prof. Dr. Zenat Adeeb Nagieb, Dept. of Cellulose and Paper, National Research Center, Cairo. Thanks are also due to Prof. Giuseppe Palleschi, Director of the Dept. di Scienze e Tecnologie Chimiche, Universita di Roma, Rome, Italy.

Endnote

1. Editor’s comments on transliteration and photos: The transliteration of Arabic into English is inconsistent. Mashrabiyya (carved wooden grille used to cover windows or balconies) is a common spelling.

   Fig. 1: El-Muallqa also appears as al-Mu’allaga and other minor variants; it is also known as the Hanging (or Suspended) Church. The church includes three sanctuaries, the central one dedicated to the Virgin Mary, the north one to St. George, and the south one to St. John the Baptist.

   Fig. 2: El-Amir Bashtak also appears as Beshtak, Bashtaq and several other variants.

   Fig. 3: Mar Mena also appears as MarMina or as St. Menas Church; it incorporates sanctuaries dedicated to Mar Bahnam (St. Bahnam or Benham) and St. George.

For information on churches in Cairo, see www.touregypt.net. The editor also wishes to thank Dr. Brian J. Spooner of the Department of Anthropology, University of Pennsylvania, for assistance with Arabic names.

Authors’ Addresses

Dr. Hany Hanna, General Director, Department of Conservation, Supreme Council of Antiquities (SCA), 8 Sayed Darwish St., El-Kousaiareen, Cairo, Egypt 11291,
Tel: +2 - 02 - 4234474, Fax: +2 - 02 - 4251411, (hhnnc@yahoo.com).
Please address all correspondence to Dr. Hanna.

Ms. Neveen Atef Meshrieky Meleka, address and phone/fax numbers as for Dr. Hanna, (nevenatef@yahoo.com).