

# Appendix VI

## English abstracts of the parts 1-3

### Part 1

**Paul-Berhard Eipper**  
**Preface to the 7th edition**  
[Vorwort zur 7. Auflage]

### Basics

**Julia Feldtkeller**  
**The enemy dust. Conservation and cleanliness.**  
[Der Feind Staub. Restaurierung und Sauberkeit]

#### **Abstract**

*Like all material objects, works of art are exposed to staining. As soon as the accumulated dust reaches a certain density, it is perceived as dirt and thus taken off. In contrast to other measures of conservation and restoration, the removal of dirt seemingly requires no further justification.*

*From the 1970s onwards, restorations have increasingly been regarded as technically unacceptable and as aesthetically quickly outdated manipulations.*

*Since then, it has been the restoration policy to reduce all interventions to an unavoidable minimum. The process of cleaning and dusting, however, has been excluded from this principle. Dusting in particular seems to be an unobtrusive measure; it removes an insignificant external substance and does not interfere with the work of art. The removal of the dust immediately leads to an improved appearance and is also perceived as evidence of the prevailing significance of the art work.*

*De-dusting is an ordinary, everyday process and has a positive impact on the general public. Only restorers, however, are authorized to clean art. They meet the professional requirements through special cleaning agents, technically elaborate methods and accompanying scientific research. The latter is e.g. concerned with the different types and impacts of dust. The overall connotations of dust and dedusting are hardly ever considered. Here, numerous aspects from very different areas are to be mentioned, such as neoplatonic light metaphysics of light and luster, dust-freeness as a sign of purity in modernity, associations of household management, ideas of hygiene and cleanliness, as well as the threat of industrial fine dust emissions in the late 20th century.*

*The handling of dust is always positioned in this overall context. Accordingly, the restorer must carefully weigh the necessities and consequences of cleaning and, in some cases, also refrain from taking off the dust.*

**Paul-Bernhard Eipper**  
**The aesthetics of cleaning cultural heritage**  
[Zur Ästhetik des Reinigens von Kulturgut]

#### **Abstract**

*Discusses aesthetical questions for reception and cleaning works of art. When a conservator-restorer has decided to clean a work of art, he has to force some questions: how does he know how much cleaning must be carried out? How do we deal with different perceptions of authenticity held by our clientele? Should they be ignored? How do we deal with our own feelings? How much do our own or other's ideas influence us in this decision? How far is one allowed to go and how much can one interpret a work of art just by cleaning it? Do we "simply" transfer our own interpretations onto the artwork? And what do we actually do – in any case – to the artwork? By examples it is shown*

*how aesthetical opinions have changed. Points out how necessary examinations before conservation treatment for the appearance of works of art are and how carefully one has to think about how far cleaning should go.*

**Ulrik Runeberg**

**Dusty structures – defective aesthetics?**

[Verstaubte Struktur – gestörte Ästhetik?]

**Abstract**

*Grime and dust can cause harm to the condition of any art work. In addition, dirt may lead to a profound aesthetical shift away from the artistic intention of an object. Notably light based and kinetic objects of the 1960s which are based on newness, serial reproduction and optical cleanliness, prove sensitive to dust and airborne dirt. This article focuses on a selection of three-dimensional art objects that belong to the foundation Museum Kunstpa-last in Düsseldorf and puts them into relation to structured facades which not only are based on the same estheti-cal effects, but also suffer from similar changes due to time, dust and dirt. Changes in light reflection especially on white and metallic surfaces can cause severe changes regarding the interference and light effects of art objects and building elements belonging to this category.*

**Ulrich Winkelmann**

**Mechanisms of deposition of airborne particles**

[Mechanismen der Ablagerung von Schwebstaub]

**Abstract**

*Dust consists of solid particulates ranging in size from 0,01 up to 100 microns. Its primary sources are com-bustion and friction processes. Coarse particulates (20 to 100 microns), are settling within few hours due to their gravity. For the settling of fine particles (0,01 to 20 microns), gravity has just a minor influence. Fine particulates can remain suspended for a long time, which is why they are called airborne particulates. Once settled particulates don't only change the appearance of surfaces, they are also responsible for chemi-cal reactions, due to their character as catalysts and carriers for accumulated chemicals. While suspended in the air, fine particles change their size and composition by coagulation and accumulation processes. Air currents, relative humidity, electrostatic charges and differences in temperature and dust con-centration have significant influence on the movement and setting of particles. Intermolecular forces, the shape of the surface and the plasticity of the particulates as well as of the settling surface are responsible for the nature and strength of the binding. Binding forces can be of great strength. The appearance of plastics in the human world has a big and still inestimable influence on particle generation, its air driven transport and the mechanisms of settlement. This fact is a not neglectable challenge for the con-servation of cultural property.*

**New methods**

**Bert Jacek**

**The so-called „soft fine blasting“: a new approach to dry cleaning of various materials and surfaces**

[Das „Weiche Feinstrahlen“. Ein neuer Ansatz zur trockenen Reinigung diverser Materialien und Oberflächen]

**Abstract**

*For dry cleaning of a variety of objects, many conservators use various types of rubbers and soft brushes. The intensive mechanical treatment of dirty materials can change the texture of the surface. In addition, rubbers contain undesired sulphuric compounds and plasticizers. Brushes can remove a lot of dust, but the remaining dust particles and mould spores will be rubbed into the surface. A new method overcomes these problems: The soft particle blasting with different types and derivatives of cellulose and starch powder. These materials are chemically inert and harmless. Fortunately, the structures of these blasting agents are very diverse, and it is possible to select from suitable types of agents for specific cleaning problems. This method allows to work both sensitively and effectively on sensitive prints (lithographs, digital prints), photo-graphs, drawings, moulded papers and parchments, fragile seals, metal, oil- and acrylic paintings, wood, stone, glass and other materials. For five years, many students and conservators used this technique for many different objects with excellent results in terms of preservation and cleaning.*

Pascal Querner; Tanja Kimmel; Michaela Morelli

### Prevention of pest infestation by cleaning

[Prävention vor einem Schädlingsbefall durch Reinigung]

#### Abstract

*In this contribution, we focus on the need of regular cleaning museum objects and also exhibition rooms and storage areas. This is an important part of Integrated Pest Management (IPM) and helps to prevent new infestations. Dust samples under the microscope help to identify insect pests and discover a source of pests on time. This is an important first step to locate pest populations within the building or on objects, prove the presence of pests and justify further (cleaning)-actions. Webbing clothes moths, carpet beetles, spider beetles, different types of silverfish, booklice or plaster beetles are the most important insects that can be found. We present a stepwise procedure how to respond, when an infested object is found and describe three examples: (1) Webbing clothes moths and other pests in dust, (2) webbing clothes moth infestation of an object and (3) evaluation of an active woodborer infestation. The right stepwise procedure is discussed: Recognizing a problem -> isolating the object -> treatment of object -> cleaning the object and surrounding area -> monitoring and/or protection (long-term isolation). Cleaning of the objects and rooms is an important part of IPM to a) prevent attracting pests to formally infested objects and b) to recognize a new infestation more easily. Finally, we describe the most important pests that can typically develop in dust in more detail.*

Astrid Hammer

### Cleaning of mould affected surfaces

[Reinigung von schimmelbefallenen Oberflächen]

#### Abstract

*Spores, active and inactive, are ubiquitous. As it is impossible to get rid of them entirely, it is key for the protection of any collection to gain control of the environment in which spores prosper or turn inactive.*

*To actively avoid the growth of mould one should:*

- *contain humidity to levels < 60% (better < 50%),*
- *protect objects with appropriate packaging,*
- *ensure good housekeeping (cleanliness),*
- *control humidity and temperature,*
- *monitor carefully the collection.*

*Apart from the above measures, protecting its collection against water damage should be one of the highest priorities for any institution. The discovery of an infestation with mould is no cause for panic, because there are possibilities and strategies to regain control of the situation. But these should be known! They involve the following steps: identifying the problem, protecting personnel, isolating materials, stabilising the environment, inactivating fungi, cleaning objects and room – if possible only dry-cleaning it, with carefully targeted secondary measures only where necessary –, and controlling the effectiveness by means of biomonitoring.*

## Surfaces of oil and acrylic colours

Paul-Bernhard Eipper

### Historical and contemporary substances, materials and methods used for the cleaning of painting surfaces

[Historische und zeitgenössische Substanzen, Materialien und Methoden zur Reinigung von Gemäldeoberflächen]

#### Abstract

*Summarizes the different cleaning materials and methods during the last centuries up to present times. Historical source material giving instructions for cleaning surfaces of paintings is summarized, and evaluated. The historic treatises were not primarily addressed to professionals, but to householders and amateurs of the arts. Summarizes dry and wet cleaning methods for painted surfaces. The examination encompasses several literary sources from pretechnological times. Points out the development of the extensive use of laundry detergents during the last decades to the mild nonionic Marlipal® 1618/25 / EMULDAC/AS-25 SC for cleaning oil paints.*

**Paul-Bernhard Eipper**  
**Examinations of painting surfaces**  
[Untersuchungen von Gemäldeoberflächen]

**Abstract**

*Summarizes the different examination methods during the last centuries with special focus on contemporary methods. Describes examinations of oil paint surfaces by loupes, microscopes, the scanning electron microscope, the environmental scanning electron microscope, the laser profilometry and the 3D-stripe projection based on micro mirrors, adapted from micro-electronic and dermatology. Untreated and treated oil paint surfaces were examined by these instruments and different comparable images (profiles) of the surfaces are given. Though not yet widely used by restorers, 3D-stripe projection produces the most suitable profiles of cleaned surfaces. It provides objective, quantitative measurements of untreated and treated surfaces before, during, and after the cleaning process. These were carried out to analyse the ability for this measurements for conservators and to document the effects of various aqueous cleaning substances and systems and their effects to cleaned historic oil paints, contemporary oil/resin, oil/wax paints. The different results of various cleaning substances were discussed.*

**Paul-Bernhard Eipper**  
**Cleaning of oil paint surfaces**  
[Reinigung von Ölfarbenoberflächen]

**Abstract**

*Taken previous examinations and mentioned literature into account, surface cleaning of oil paintings is described step by step. Different ideal materials, methods as well as hints for the cleaning process are mentioned in detail. At first, dry cleaning methods for oil paint surfaces are described, followed by wet cleaning methods for oil paints if dry methods fail.*

*When dry cleaning with compressed air alone is not sufficient, it is possible to remove dirt from the surface by dabbing with Plextol D 360-coated pieces of cloth. Soft and dry latex powders or latex sponges (akapad) can be used in a second step. Sometimes wet cleaning is unavoidable. Therefore it is necessary to choose a suitable aqueous substance which is not as aggressive and uncontrollable as demineralized water. Contact times between paint and cleaning solution should be minimized, and soft microporous sponges (Blitz-Fix) should be used, not cotton swabs. In contrast to the cleaning of acrylic paint surfaces, there are more possibilities for modifying aqueous cleaning methods. Small additions of surface active substances such as the mild nonionic Marlipal 1618/25 or methylcellulose for thickening the solution are possible. Extending contact time, raising pH (max. pH 6-8), temperature (max. 30 °C) and additions of small amounts of solvents and additions such as champagne chalk can be useful.*

**Paul-Bernhard Eipper**  
**Surface cleaning of acrylic paintings**  
[Acrylfarben-Oberflächenreinigung]

**Abstract**

*The history and composition of acrylic paints is given in detail. Different surfaces of oil and acrylic colours are shown. The cleaning of acrylic-colour painted surfaces are very difficult because they are composed of numerous ingredients. Grime and dirt are a greater hazard to soft and sticky acrylic-paint-surfaces than oil-paint-surfaces. The common practice of dry and wet cleaning seriously harms acrylic-paint-surfaces. In contrast to various cleaning methodologies for oil-paints, it is not possible to adapt these cleaning techniques to acrylic paint, because these paints react more sensitively to every surface cleaning. Different effects caused by different cleaning solutions on acrylic surfaces are shown by 3D-stripe projection images. When dry cleaning with compressed air alone is not sufficient, it is possible to remove dirt from the surface by dabbing with Plextol D 360 coated pieces of cloth. Even the use of soft and dry latex powders or latex sponges (akapad) can rub the dirt in the acrylic-paint. Wet treatment with solvents, demineralized or magnetized water or saliva is unacceptable. These liquids causes leaching and swelling of the paint: they interact with constituent parts of the paint and remove components. If wet cleaning procedures are unavoidable, it is necessary to choose a suitable water substance which is not as aggressive as demineralized water. Contact times between paint and cleaning solution should be minimized and soft microporous sponges ("Blitz-Fix") should be used, not cotton swabs. In contrast to cleaning oil-paint surfaces, there are few possibilities of modifying aqueous cleaning methods. Small additions of surface active substances such as the mild anionic Marlipal® 1618/25 = EMULDAC/AS-25 SC (0.00025%) or methyl cellulose (2g/100ml water) for thickening the solution are*

possible. Raising pH (max. pH 6-8) and temperature (max. 25°C) can seriously damage sensitive surfaces. Methods to prevent the dirtying of acrylic painting surfaces are necessary, because cleaning harms their surfaces.

**Ulrik Runeberg**

### **Foxing on acrylic paintings painted on fibre board**

[Stockfleckenbefall bei Acrylmalerei auf Hartfasermaterial-Bildträgern]

#### **Abstract**

*Hardboard served as a common and popular support for many modern and contemporary paintings. Some artists considered hardboard to be a stable, light and economic alternative to solid wood panels and other rigid supports, whereas others rejected the processed and compressed wood fibre boards as an inferior industrial construction material of low aesthetical value.*

*From the conservator's critical point of view, the many disadvantages to be found in this material, such as high acidity, hygroscopic character, tendency of deformation, and the flaking of certain painting materials in the case of tempered hardboard, outweigh by far the positive aspects of this material as support for paintings.*

*A very characteristic damage found on acrylic colour and other porous painting media on hardboard is the formation of stains, which may manifest itself in a variety of ways, including ligneous residues, bleeding extractives, and microbiological growth. This contribution aims to describe and differentiate such characteristic stains, and provides a practical treatment proposal to reduce, neutralize and disinfect stained acrylic paintings on hardboard through the application of an alkaline absorber.*

**Paul-Bernhard Eipper**

### **Reinigung von Farboberflächen mit Laserstrahlen**

[Cleaning of paintings with laser devices]

#### **Abstract**

*Summarizes publications on laser cleaning of painted surfaces, especially the cleaning of oil and acrylic paints. Information on the function of a laser apparatus is given. The article compares merits and limits of different cleaning methods. The essay concludes that, in contrast to its suitability for other surfaces, such as gilding or bone, laser technology, due to its actual state of development in our times, is not recommended for cleaning oil and acrylic paintings except „ultima ratio“ treatments of paintings exposed to fire and, in certain cases, removal of overpainted areas.*

**Sabine Maier**

### **Surface cleaning of heavily damaged panels and canvas paintings**

[Oberflächenreinigung extrem geschädigter Tafel- und Leinwandmalerei]

#### **Abstract**

*Diffusion of ingredients of the paint layer (fatty acid components) can cause, due to specific surface changes severe problems for special conservation treatments on especially expressionist paintings. It is of essential importance to get knowledge of these material inherent changes which lead to specific appearance of surfaces. Intended cleaning procedures, or removal of overpaintings or varnishes have to be considered due to conservatoric needs. Due to specific conditions caused by the degradation of the materials of the piece of art to be treated, options of cleaning technically and aesthetically have to be considered carefully. The selection of the adequate cleaning process for the artwork to be treated depends on the changes in the paint layer and the surface.*

## **Sculptures and furnitures**

**Sabine Maier**

### **Cleaning of bare wood surfaces**

[Reinigung holzsichtiger Oberflächen]

#### **Abstract**

*The artistic effect of transparent wood sculpture is characterized by the abolition of the polychrome carving of details and special finishing the surface. This results in a surface-sensitive material that gains its specificity by*

various surface gloss and glaze colors.

This is the design intention reception historically conditioned form of treatment compared with „Holzsichtigkeit“ in contrary. Since a lack of polychromy was misunderstood, the appearance is often obscured by harmful interference and inadequate covers and frames.

The boundaries of the cleaning success is determined by surface damage and the severity of the surgery. In addition to the conservation need is to harmonize various surface conditions by cleaning stepped degrees often the last opportunity to win the opposing sculptural readability.

**Peter Kopp**

### **Cleaning of furniture surfaces**

[Reinigung von Möbeloberflächen]

#### **Abstract**

Furniture surfaces and wooden fittings and fixtures consist of various materials and are created from differing materials. From this follows that the cleaning of these surfaces is governed by differentiated approaches to the respective material based on a knowledge of the chemical changes resulting from ageing. Of course, there are a multitude of approaches.

In the first part, focus is given to the wet chemical procedures and the possibilities, risks and safety values are described. Alongside a formulation appropriate to the material (choice of solvent, ionic concentration, pH-value, the possible addition of a chelating agent, tensides or enzymes), the consistency of the cleaning medium influences the success of the cleaning treatment decisively. There is a difference whether cleaning is undertaken using fluid, foam or thickened mediums or with removable elastic or rigid gels. For this reason, special consideration is given to possibilities offered by the variety of polymeres and biopolymeres available.

In the second part, approaches to the cleaning procedures of furniture surfaces are illustrated with case examples. Together with dry cleaning, cleaning with dry ice and lasers, and the use of wet chemical treatments is presented.

**Sabine Maier**

### **Cleaning of polychromies. Notes on the treatment of polychrome and monochrome bare wood retable sculptures**

[Reinigung von Fassungen: Zur Behandlung polychromer und monochrom-holzlichtiger Retabelskulpturen]

#### **Abstract**

In approaching the cleaning of sculptures, it is important to know the history of changes of form and surface treatments that have befallen the object. Often, numerous operations have been effected to modify its aesthetic appearance to suit contemporary taste. Surface changes, or their removal, and the consequences of conservation interventions are relevant to the cleaning of sculptures. Both plasticity and surface roughness can expose sculptures to the effect of ambient pollution. In consequence, cleaning is a challenge to conservation. The objective of cleaning must be appropriate to achieve the sculpture's unity of form and retain its intended state of polychromy.

**Sabine Maier**

### **The cleaning of leaf metal in panel paintings, sculptures, altar screens and frames**

[Die Reinigung von Blattmetall-Oberflächen in Tafelmalerei, Skulptur, Altarschrein und Rahmung]

#### **Abstract**

Cleaning processes in precious metal-sheet pads in panel painting and sculpture in versions represent a particular problem. Because of low layer thickness of the metallic pads, conventional cleaning methods are used only partially. Sheet metal variation uses made rich; Corrosion as a patina or irreversible changes may have changed original ornament intentions. In addition to changing interventions adhering surface dirt result in gloss and form losses. Aqueous cleaning process sources bolus and chalk ground, which leads to loss of adhesion of the gold leaf. A modern method is the Nd: YAG laser-cleaning method. Dirt particles on the surface of the layer evaporates. The process is not yet fully mature, but; therefore microanalytical process of verification of laser-based cleaning results in the context of the introduction process are deemed necessary.

**Paul-Bernhard Eipper; Julia Hüttmann; Melitta Schmiedel**

### **Surface cleaning of polychromed sculptures**

[Oberflächenreinigungen an Skulpturenfassungen]

#### **Abstract**

*Taking as example some sculptures and reliefs, the effectiveness of dry and wet cleaning practice is described. After dry cleaning of painted and gilded surfaces with compressed air, or by dabbing the surfaces with coated swabs (Plextol® D 360 or Lascaux® 360 HV) or with cosmetic sponges made of PUR or with latex powder and -sponges (e.g. "wishab®", "akapad®", "wallmaster®") and „Groom Stick®“), the following wet cleaning should only be carried out if coatings on the surfaces are intact. The use microporous sponges is recommended instead of cotton swabs which has been shown to harm such surfaces by scratching them. Only the "Blitz-Fix®" type points out to be soft enough for the treated surfaces. Guidelines how to clean surfaces are given.*

## **Photographies**

**Kerstin Bartels**

### **Cleaning of photographs**

[Reinigung von Fotografien]

#### **Abstract**

*Surface cleaning of cultural heritage is always an act of interfering with its integrity, consisting of aesthetical and historical values. Even if photo conservation is one of the younger disciplines in conservation and the "body" of photographs will never get the same attention as drawings, graphics or paintings do, the integrity of photographs is to respect focusing on their very particular and fascinating features and traces.*

*With respect to this, cleaning of silver gelatin prints requires profound knowledge of their given material qualities, with special attention to the physical and chemical nature of gelatin and its altered properties and behaviour over the course of time.*

*Prior to conceptualising or planning any measures, some important questions need to be answered, for example: Is the image layer at all based on gelatin? Is the gelatin surface hardened or does it contain matting agents like starch grains? Are there any traces of retouching on it? Could the surface be coated? The results will directly influence the method and the adequate materials for dry and wet cleaning. Equally important is the passed-on condition of the gelatin image layer, but neither no visible examination nor scientific analysis can help in assessing. The conservator rather has to follow a sensitive, empirical approach of testing gradually the interaction between cleaning media, soil and surface and to interpret the results.*

*The aim of this contribution is to highlight and sensitize for the diversity of silver gelatin photographs, their structures and surfaces, to discuss aspects of dry and wet cleaning and to lead to a prudent approach for practical cleaning measures.*

## **Textiles**

**Tanja Kimmel; Britta Schwenck; Barbara Eisenhardt**

### **Remarks on the cleaning of textiles at the Institute of Conservation at the University of Applied Arts Vienna**

[Zur Reinigung von Textilien am Institut für Konservierung und Restaurierung der Universität für angewandte Kunst Wien]

#### **Abstract**

*The four areas of specialist study at the Institute are divided into conservation and restoration of paintings, artefacts, textiles and stone. Due to its focus on projects and practical experience, the Institute under the direction of o.Univ.-Prof. Mag. Dr. Gabriela Krist is an acknowledged co-operation partner both nationally and internationally. Apart from the projects undertaken at the Institute of Conservation, special examples were chosen to give an overview of well-established cleaning methods and solvents. After an introduction of the complexity of dust problems, different methods of surface and wet cleaning are described. Which method to choose depends on material properties, processing technology as well as textile condition and degree of dirt. Different dry techniques for surface cleaning such as using a vacuum cleaner or dry cleaning sponges are discussed. The wet cleaning with surface-active agents (non-ionic/anionic) to remove bonded soiling is explained by cleaning historic textiles in a bath or on a suction table.*

**Hilde Neugebauer**

**On the cleaning of textiles with low pressure fog**

[Über die Reinigung von Textilien im Aerosolnebel mit Unterdruck]

**Abstract**

*The contribution describes the aerosol washing unit at Schönbrunn, Vienna, Austria, which is an appropriate conservation cleaning method for valuable textiles, including tapestries, wall coverings, and flat-woven fabrics. The usual cleaning methods applied to historic textiles have the inherent danger of causing bleeding of water-soluble dyes, distortion, and damage to the sensitive structure of the fabrics, all irreparable. The aerosol washing unit provides a cleaning process for historic and valuable textile objects that is gentle, proves colorfast, and maintains the original shape. Due to the generous dimensions (8 x 5.4 m) of the apparatus as well as the specially developed two-step process, the unit is suitable for large textiles. Following a professional evaluation of the condition and any possible existing damage, the fabric is tested. Specific areas are then cleaned gently on an aqueous aerosol basis with the minimum implementation of pure tenside (Marlipal® 1618/25) and then dried as quickly as possible. After the cleaning process, contours and patterns are more easily visible. Subsequent recommended treatments include professional conservation mounting to round out the successful cleaning procedure for valuable textiles.*

**Special cases: bone conservation**

**Martin Unruh**

**Bone maceration for conservation**

[Knochenpräparation und Restaurierung]

**Abstract**

*Describes the cleaning of bones. Points out the necessity of clean, fat free, uncoloured material for bone preparation. Focuses on cleaning and enzymatic maceration of bones with papain and enzyrim.*

*Discusses defatting bones with solvents and enzymes and gives detailed informations of the different cleaning processes. Points out how necessary it is to protect bone surfaces against dirt for example by coating surfaces with ethylmethacrylate or methylacrylate. Discusses the possibilities for restoration of displayed historic skeletons. Gives detailed recipes.*

**Martin Troxler**

**Cleaning and conservation of bones**

[Reinigung und Restaurierung von Knochenpräparaten]

**Abstract**

*Old bones are a delicate material to deal with. Fatty acids have often caused damages and they prevent aqueous measures of cleaning and restoring. This leads to necessary steps of deacidification beforehand. Different possibilities of evaluation of old bones are described in the paper. The methods of cleaning and deacidification mentioned were tested on a wide collection of skeletons in the Natural History Museum of the Burgergemeinde Bern.*

**Special cases: leather and urushi lacquers**

**Kristina Blaschke-Walther**

**Surface cleaning of leather – the removal of leather care products**

[Oberflächenreinigung von Leder – Die Entfernung von Lederpflegemitteln]

**Abstract**

*Some leathers show a sticky, thick, glossy surface layer which seems to be due to an earlier conservation treatment. The coating has caused flaking, resulting in the danger of the entire leather surface flaking away. This would involve an irretrievable loss of the grain and the decoration of the leather.*

*This contribution actualizes a student work in which such coatings were analyzed. It was concluded that a leather dressing must have been very thickly applied. Different methods for the removal of this coating were evaluated. The*

most important requirements for a suitable removal method were that it should transport neither excessive moisture nor too many solvents into the leather itself. The surface should be cleaned without causing new damage to the leather. Finally a method using a solvent mixture with various ratios of components proved to be the most suitable. The thickly applied, glossy leather dressing was successfully removed.

**Nanke Schellmann**

### **On the cleaning of East Asian (*urushi*) lacquers**

[Über die Reinigung ostasiatischer (*Urushi*-)Lacke]

#### **Abstract**

*The cleaning of East Asian (*urushi*) lacquer surfaces is a complex task. When newly manufactured, these coatings are well known to be durable and unaffected by almost any solvents. However, with the onset of ageing, the lacquer polymer changes its properties as it degrades under the influence of UV and visible light radiation and recurring changes in relative humidity. Considering that most lacquerware in Western collections is expected to have suffered some exposure to unfavourable environmental conditions during their lifetime, the specific sensitivities of degraded lacquer surfaces have to be well understood to prevent further damage to occur during cleaning.*

*This chapter will give an overview on the currently practiced and recommended methods for cleaning aged and degraded lacquer surfaces. The properties of East Asian lacquer and their degradation phenomena are introduced followed by an overview of the most common types of soiling, accretions and damages observed on lacquer surfaces. To increase awareness of possible risks, specific types of lacquer and décor which may be too fragile for a straightforward application of cleaning methods, are also discussed. The main section of the chapter finally presents several approaches for the safe cleaning of degraded lacquer surfaces, ranging from dry methods to the use of various organic solvents and aqueous solutions.*

## **Part 2**

### **Paper and parchment**

**Helmgard Holle-Nußmüller**

### **Surface cleaning of works of art made of paper. Historical and contemporary cleaning material and its use in paper conservation**

[Oberflächenreinigung an Kunstwerken oder Kulturgut aus Papier. Historische und aktuelle Reinigungsmaterialien und deren Anwendung in der Papierrestaurierung]

#### **Abstract**

*The compilation of historical eraser and scarping materials and instruments that were either used in studios and scriptoria show how difficult it was to get hold of good and useful materials. Some methods like the handling with the scarping knife and cuttlefish bone show a rather careless treatment of the paper surface. In the course of time thanks to the progress in chemistry and technology and the invention of the eraser this was changed positively.*

*Today a large variety of eraser materials are available but only a few are applicable for works of art and cultural possessions of paper. Some selected eraser materials were presented and discussed especially those which have been used in conservation labs as harmless cleaning materials. Some had to be critically tested as eventual damage could be caused after application. Among them were eraser materials that contained genuine and synthetic rubber or the chemical substance *faktis* (an artificial oil rubber) because of their sulphur is alarming.*

*Eraser materials that contain PVCs, which have a high share percentage of plasticizers which can release hydrochloric acid under certain conditions, they can cause a damage of the paper eventually. Therefore in principle after each surface cleaning-even with harmless classified eraser materials – all visible remaining particles should be carefully removed. A reaction of the remaining eraser material on paper and applied printing, drawing, painting or writing materials can be prohibited.*

*Investigations of changes of the surface caused by mechanic impact by eraser materials on paper or other applied artistic techniques such as shining or roughening of the surface have not been made yet.*

**Ulrike Hähner; Karin Petersen; Gerhard Banik**

**Electrostatic cleaning of surfaces: a technique for mild mass treatment of historical documents**

[Elektrostatische Reinigung von Oberflächen: Ein Verfahren für die schonende Mengenbehandlung historischer Dokumente]

**Abstract**

*Cleaning the surfaces of cultural artefacts on paper is a vaguely defined procedure in conservation. In general, however, the term refers to removing from paper surfaces contaminants that are not attached to the paper. A machine-assisted treatment method has been recently developed to remove dust and biological contaminants from paper, photo materials, printed transparent foils and textiles. It can be used to clean large stocks efficiently and without mechanical impact on the object surfaces. Contaminant removal is performed by frictionless application of an electrostatic foil. The method is limited to the removal of particles from surfaces and/or from indentations in the surface textures of papers and textiles. However, it is not suitable for removing any discolouration or contaminants that have penetrated into the depth of the material, contaminants that are stuck together with the surface, or in-grown biological contaminants. Hence, improvement of the visual aesthetic appearance of objects will be achieved only to a limited extent. The technology allows removal of dust contaminants from both sides, even from very delicate surfaces, while entirely keeping existing drawing and writing materials or pigment layers intact. Approximately 80 objects per hour can be processed, each having a width of 1 m and a length of 1.50 m. The system is a device which is expandable by modules, and two digitization units have been recently added to its technical equipment, digitizing both sides of each object in one cycle combined with the cleaning process. The advantages and limits of this technology will be shown by means of examples, as will be the methodology of quality management and control of the cleaning process, which has also been newly developed.*

**Ryszard Moroz**

**Mechanical cleaning of paper, cardboard, paperboard, leather and parchment**

[Mechanische Reinigung von Papier, Pappe, Karton, Leder und Pergament]

**Abstract**

*Dry cleaning is a laborious but often a crucial step in the restoration or conservation treatment of graphic objects. Reportedly, certain ingredients of eraser materials as well as some cleaning techniques are at high risk to cause damage to the paper. Among these dangerous substances are cleaning agents, which consist of or partly contain natural or synthetic rubber with sulfurous constituents. Also materials containing PVC highly endanger the paper, because PVC is made of softening agents that under certain circumstances even excrete hydrochloric acid.*

*The large variety of surface qualities, methods of cleaning and available detergents gave cause to developing a new approach, which is described as "partial gradual dry cleaning".*

*One has to remove all visible particles from the surface paper, even seemingly harmless eraser materials, to prevent a possible chemical reaction with the paper or the applied paint, print, drawing or writing on the paper.*

*Further research on the topic is still to be done with regard to other surfaces, art techniques and used material. The eraser robot is a mechanical tool that automates the conservational dry cleaning of paper works. It mechanically removes the dirt from the paper's surface. This leaves only the edges and areas with tears to be cleaned by hand, to avoid any further damage.*

**Jan Hallek**

**Eraser robots for dry cleaning of paper surfaces, graphics and painted surfaces**

[Radierroboter zur Trockenreinigung von Papieroberflächen, Graphiken und Malschichten]

**Abstract**

*The benefits of using the eraser robot:*

- *It highly reduces the amount of time spent by the conservator on dry cleaning which is a monotonous and ergonomically unfavorable treatment stage.*

- During the process conservator can simultaneously work on different task.
- It increases output in the conservation lab.
- The customer gets a better value for money: higher quality and efficient dry cleaning that saves conservator's time.

The first version of the eraser robot was completed in February 2006 and has performed reliably since. The updated version of the eraser robot can be disassembled without tools, so it can be easily packed and transported or stored in order to save space. The eraser robot is equipped with a separate control panel. The control panel allows changing the parameters and controlling the cleaning time and its final result. It is accommodated in a 19 inch casing and can also be transported. According to multiple tests and experience with treated objects, the best results are achieved using a low working pressure and more repetitions.

**Friederike Krause; Ulrike Hähner; Gerhard Banik**

**Physical stress caused to paper by manual surface cleaning techniques**

[Mechanische Belastungen durch manuelle Oberflächenreinigungstechniken auf Papier]

**Abstract**

Surface cleaning of cultural artefacts in conservation is not a precisely defined operation. In general, the term refers to mechanical treatments for removing contaminants such as superficial dust, soot and other deposits that are not caked together with a surface. In paper conservation, surface cleaning mainly is done by moving erasing media, such as different erasers or sponges, cleaning textiles, soft brushes etc. on objects' surfaces with careful horizontal, vertical or circular motion and under slight pressure. The unavoidable mechanical impact carries the risk of causing undesired side effects. This contribution attempts to precisely classify the different movement types, describe them in detail and experimentally evaluate them in respect to their effectiveness and associated side effects. These experiments show that the mode of application has a strong influence on the cleaning results and side effects such as abrasion, changes in its texture and compression of the paper web.

**Christoph Schölzel**

**Cleaning of pastel drawings**

[Reinigung von Pastellen]

**Abstract**

Although the specific artistic procedure used in pastel painting generally precludes any cleaning of the surface, certain conditions nevertheless call for practical restoration measures to be undertaken on these fragile objects. As well as surface cleaning, the removal of mould plays an important role. Isolated references to this in the literature are traced back as far as the earliest restoration reports and are compared with the author's own practical experience. Particular attention is paid to preventive measures for the conservation of these works of art.

**Cleaning archaeological finds**

**Michael Marius**

**Cleaning of excavated artefacts**

[Reinigung von archäologischen Bodenfunden]

**Abstract**

The author surveys the problems of conservation of different excavated archaeological material. He summarizes various various historic and still contemporary used methods of cleaning diverse archaeological artefacts. The article sensibilises for the hazards which can occur when excavated artefacts were stored. Mostly ideal storage conditions cannot be achieved. Dry or wet cleaning of artefacts can reduce original substance and can cause to unauthentic surfaces. The author criticises abrasive methods and the use of deionised water on non salt containing excavated artefacts.

**Peter Berzobohaty**

**Observations to the cleaning of mosaics**

[Betrachtungen zur Reinigung von Mosaiken]

**Abstract**

*This article mainly presents the steps in construction of mosaics, but also touches aspects of their preservation and can even question some methods of their presentation.*

*Sometimes colour underneath the tesserae is misinterpreted as to have its origin from the tesserae material itself, but as is shown, there was a fresco painting underneath. Even the cleaning of the backside of detached mosaics has to be questioned in this light.*

*Salts and varnishes are mostly a danger, conservators must deal with. The constant watering of mosaics for cleaning and photo purpose should be avoided.*

**Frieda Meißner, née Wolf**

**The cleaning of excavated funeral textiles with aerosoles**

[Die Reinigung mit Aerosolen bei der Restaurierung von Grabtextilien]

**Abstract**

*Textile finds from burials is of particular importance, because they are ethical not meant to get exhumed. Nevertheless, they provide valuable information for archaeological and historical research. The textiles of the Burgsdorff tomb in Berlin-Mitte are fragmented remains, with silk and metal threads, of the dress from Ludwig von Canitz from the 17<sup>th</sup> century. Due to different environmental parameters, they were exhumed in a very poor conservation status. The fragile textile was in danger to get reduced even after excavation. Therefore, the long-term preservation of the textile clothing had to be kept in focus, in order to analyze the details and to develop a cleaning concept treating the fragments with greatest care. A cleaning procedure with an airbrush system was tested.*

**Karl Tobias Friedrich**

**The cleaning of excavated glass: an introduction**

[Die Reinigung von Glas aus archäologischem Kontext: eine Einführung]

**Abstract**

*This paper addresses the subject of cleaning corroded glass from archaeological contexts. Since the choice of suitable methods is strongly dependent on the state of preservation of the glass, a basic overview on the chemical and geochemical background of the composition and deterioration processes of alkali silicate glass is provided. The various corrosion phenomena and possible treatments are demonstrated by two groups of archaeological glass, representing freshly excavated finds as well as glass objects from a museum collection with unknown archaeological context.*

**Works of art**

**Eva Putzgruber; Birgit Müllauer**

**General remarks to the cleaning of glass surfaces**

[Reinigung von Glasoberflächen]

**Abstract**

*Chemical changes can occur on glass surfaces in contact with water, producing different surface phenomena, which are listed and explained. Dry and wet mechanical methods for the removal of dust, dirt, and soil are discussed. The prevalent use of water as a solvent for these deposits is questioned, and the preferred method of cleaning glass surfaces with ethanol is advanced. The authors point out that modified surface layers have to be preserved despite their visually modified appearance, since they carry information about decor and use.*

**Sebastian Strobl**

**To clean or not to clean – remarks relating to the question of cleaning stained glass**

[To clean or not to clean – Zur Frage der Reinigung von Glasmalereien]

**Abstract**

*This article describes the various options for cleaning stained glass, be it painted or unpainted, leaded-up or otherwise glazed, soiled or corroded (hydrolytic corrosion, microbially-induced corrosion, sub-surface corrosion). The various methods of dry-cleaning are being discussed as much as wet-cleaning, chemical cleaning and laser-cleaning. Advantages and disadvantages of a given method over the others are being explained and exemplified. Finally, a brief chapter also covers the treatment of lead-calmes and lead-light cement (putty). An overriding emphasis lies on the importance of the guiding principle that cleaning, being after all an irreversible process, has to be fully justified and a method-statement established before commencement of work.*

**Rainer Richter**

**The cleaning of true enamels**

[Reinigung von Emailarbeiten]

**Abstract**

*Whereas conventional cleaning methods can be applied for the majority of vitreous enamels, specific cases of alteration require a well balanced mix of consolidation, cleaning and preventative treatments. European enamels dating from the 14<sup>th</sup> to the 18<sup>th</sup> century are frequently susceptible to deterioration induced by tensile or compressive stresses and / or corrosion phenomena of the vitreous coating and adjacent metals of the compound material. The cracking, flaking and crizzling of enamels may occur in conjunction with the deposition of dust and dirt. These matters are possibly aggravated through the raising formation of dry or deliquescent corrosion products. This process is considerably accelerated by humid conditions and the presence of high levels of environmental pollutants within tightly sealed display or storage compartments. A previously introduced consolidant also may interfere with actual treatments. Combined strategies of the removal of foreign material and the preservation of original material must be applied. The use of subtle mechanical methods and / or mainly polar solvents such as deionized water and ethanol are described. For long term effects the application of complexing agents for the reduction of stubborn or inaccessible corrosion products should be investigated critically. The results of corrosion studies on enamels have become available recently and these may help with the development of treatment methods which reduce the risk for the silica network. The consolidation and cleaning measures should always be backed up by suitable preventative strategies to effectively slow down deterioration processes in the future.*

**Heike Ulbricht**

**Giving some thoughts to dishwashing. On the cleaning of porcelain**

[Nachdenken beim Abwaschen. Zur Reinigung der Oberflächen von Porzellan]

**Abstract**

*The contribution gives two examples of historic treatment of porcelain objects. From the contemporary view, these former invasive interventions to the original surfaces, can not be a today's cleaning perspective. Due to storage and presentation condition mould growth (*Aspergillus glaucus*) on uncleaned porcelain surfaces was detected. The cleaning detergent which has to be determined, should not support mould growth (which was detected even on dry pieces of porcelain). The cleaning of porcelain surfaces was carried out by use of 0.2% solution of the non-ionic detergent Marlipal® 1618/25. Astonishingly, after cleaning it was obviously, that in the mould affected areas the surfaces reached a specific brightness which cannot be achieved by cleaning. Generally valid notes and specific characteristics for the cleaning of porcelain were given.*

**Karl Tobias Friedrich**

**Remarks to the cleaning of glazed and unglazed porous earthenware**

[Unechtes Porzellan im Fokus: Anmerkungen zur Reinigung von glasierter und unglasierter poröser Irdenware]

**Abstract**

*The conservation of ceramic materials in art in general has been addressed in some fine standard reference books of the 20<sup>th</sup> century. This paper focuses on cleaning aspects of European faience as a – to some extend – typical*

*specimen of glazed and unglazed earthenware. Thus, the collection of German faience in the Museum of Applied Arts of Cologne, Germany, serves a case study for demonstration. In order to introduce the subject to professionals and students of other fields of research, an overview on the production techniques and some technological characteristics is provided. Finally, a selection of common methods is presented and discussed.*

**Martina Griesser-Stermscheg**

**Dust, rust and patina. The cleaning of metal surfaces**

[Staub, Rost und Patina. Die Reinigung von Metalloberflächen]

**Abstract**

*This paper gives a rough overview on the bog topic “metal cleaning“. The leading questions are: Why do metals corrode, why do we clean and especially: How do we clean? Thoughts are given on the cleaning goal, definitions like “Alterswert“ and “patina“ as well as to the necessity for or even against cleaning of metals and the preservation of patina. Conventional and new methods of cleaning of silver, copper and its alloys as for wrought iron are discussed, commented and practical examples are provided.*

**Gunn Pöllnitz**

**The theoretical und practical challenge to clean painted metals: an rapprochement**

[Die theoretische und praktische Herausforderung der Reinigung bemalter Metalle: eine Annäherung]

**Abstract**

*Painted and coated metals seem to play a special role in conservation science as they were used in a broad range of application: there are paintings on rigid metal supports as well as industrial heritage objects made from coated metals. Naturally, demands of objects and also practical measurements differ with size, background and (former) usage. Thus this article gives a short overview of recently published research concerning cleaning of several paint materials on metal and also addresses some fundamental questions about what might cleaning mean from different practical perspectives.*

**Johanna Lang**

**On the cleaning of wax objects**

[Zur Oberflächenreinigung von Wachsarbeiten]

**Abstract**

*Wax artefacts make special demands on the surface cleaning during conservation. Reasons for this are, amongst others, the physical and chemical properties of the basic material wax itself as well as the actual composition of the bulk wax that might have been mixed with other substances during the making of the artwork. Hence, several factors need to be considered before the actual cleaning process can take place and only few cleaning agents and methods finally come into question. Cleaning-tests carried out on test-specimen made of different kinds of wax clearly demonstrate this and a literature review reveals the change that occurred to conservational cleaning of wax surfaces over the decades.*

**Rainer Holz**

**Prospects to clean architectural cork models**

[Möglichkeiten zur Oberflächenreinigung an Architekturmodellen aus Kork]

**Abstract**

*In the middle of the 18th century, there was a surge in interest in antiquity. Miniature copies of ancient buildings and ruins were produced for rich travellers. Architectural cork models served as souvenirs and objects for study. For example, there 29 models of temples, around 1800, were created by Carl Joseph May, a cork modeler situated in Erfurt. Like many other objects of its kind, these models were hidden in storage rooms (or even been re-used as toys) for the last 200 years with consequent damage. The contrubution describes methods developed for the dry cleaning of painted cork models. Discusses merits and limits of several cleaning possibilities. Mostly compressed air and erasers can be recommended for safe surface cleaning of the cork models.*

**Cornelia Hofmann**  
**Conservational cleaning of old feathers**  
[Die Reinigung von Vogelfedern]

**Abstract**

*New and undamaged feathers are very tough and can be easily cleaned. Things are different, however, with the feathers from our museum collection. They were often damaged by light, dust and insect infestations. In this case, you often have no other option than to remove the dust carefully with a soft brush. Afterwards, the feathers may be cleaned with plenty of water, containing some surfactant. Careful drying is unavoidable.*

**Paul-Bernhard Eipper**  
**How to clean and protect amber**  
[Bernstein und dessen Oberflächenreinigung]

**Abstract**

*After offering information on the origin, texture, and other characteristics of amber, this essay summarizes historic and current treatment of amber surfaces. The author reviews current methods, and cleaning of amber surfaces with vitalized water by Grander Technology is investigated and described in detail. Varnish and wax coatings are also discussed.*

**Paul-Bernhard Eipper**  
**The cleaning of pearls and mother-of-pearl**  
[Reinigung von Perlen- und Perlmutter]

**Abstract**

*After a review of information on the origin, texture, and characteristics of pearls and mother of pearl, historic cleaning procedures of such surfaces are summarized. The essay reviews contemporary cleaning methods before investigating and describing in detail new methods of mild surface cleaning with vitalized and modified water by Grander Technology and minimal surfactant additions (Marlipa®1618/25, 0.00025%).*

**Paul-Bernhard Eipper**  
**The cleaning of monochrome ivories**  
[Die Reinigung ungefaßter Elfenbeinoberflächen]

**Abstract**

*After offering information on origin, texture, and characteristics of ivory, this essay summarizes historic cleaning procedures of undyed and unpainted ivory surfaces. Contemporary cleaning methods are reviewed, followed by detailed description of new methods of mild cleaning with vitalized water and minimal surfactant additions (Marlipa®1618/25, 0.00025%).*

**Paul-Bernhard Eipper**  
**The cleaning of tortoise shell and horn**  
[Reinigung von Schildpatt und Horn]

**Abstract**

*After offering information on origin, texture, and characteristics of tortoise shell and horn, this essay summarizes historic application and cleaning procedures of tortoise shell. Contemporary conservation, completion and cleaning methods are reviewed, followed by detailed description of a new method of mild cleaning with modified vitalized water and minimal surfactant additions (Marlipa®1618/25, 0.00025%).*

**Birgit Seeländer**

**The cleaning of fine straw-works – a short report**

[Die Reinigung von Stroharbeiten – ein kleiner Erfahrungsbericht]

**Abstract**

*Straw is a versatile agricultural by-product, which can be turned into surprisingly beautiful pieces of artistic craftwork. However, these objects season and, if uncovered, are coated with dust, which can just be removed to the greatest extent. In doing so, care has to be taken because the material can break quite easily. Good experiences have been made with dry cleaning (brushing, suction), and, in pertinacious cases, with microporous sponges and boiled, cooled down to 30 °C, tap water.*

**Plaster, terracotta, stone and murals**

**Jan Hamann**

**The cleaning of terracotta**

[Terrakotta-Reinigung]

**Abstract**

*Terracotta is a material which has been widely used in the past for sculptures and architectural work. In northern Germany terracotta has been utilized for decorative elements in buildings from the Gothic period on up until the 20<sup>th</sup> century. Surface soiling is frequently found outside and may be caused by various environmental factors. The different deposits on the surface lead to conservational and aesthetic impairment. Terracotta is a ceramic material and due to its composition and production process it requires an appropriate cleaning method. Systematic methodology and classification of damage prior to any surface cleaning are just as necessary as scientific examinations to determine the causes and types of deposits. Different problems and their solutions are demonstrated with the help of practical examples. Also in this area of conservation one can often observe: less is more.*

**Jörg Breitenfeldt; Aurelia Badde; Rolf Kriesten**

**On the cleaning of plaster surfaces**

[Über die Reinigung von Gipsoberflächen]

**Abstract**

*This paper reviews historical cleaning methods for plaster surfaces and compares these to contemporary cleaning practices. Case studies demonstrate the variety of surface materiality of plaster, meaning those surfaces that include gypsum or plaster of Paris as the main component. In addition, the authors deal with hemihydrate and high-temperature gypsum plaster and so-called marble cement, which the authors dealt with during the restoration of the Neues Museum in Berlin. Different surface treatments and individual surface histories are also addressed, while taking into account the diversity of gypsum plaster due to modifications carried out during processing. Soiling on plaster is discussed, and three poulticing methods for untreated plaster surfaces are demonstrated on different artists' models and plaster casts. Two case studies demonstrate varying approaches and procedures for dealing with coated plaster surfaces. Conservation and cleaning of originally painted plaster surfaces are exemplified on a model for a frieze by Hermann Schievelbein. Removal of multilayered coatings from plaster is represented by the portrait busts in the Herzogin Anna Amalia Bibliothek in Weimar. The application of a whole range of dry and wet cleaning methods is illustrated by the stucco and marble-cement surfaces in the Neues Museum.*

**Lisa Gräber; Johann Nimmrichter**

**The cleaning of stone surfaces**

[Die Reinigung von Steinoberflächen]

**Abstract**

*Gives an overview of cleaning techniques and materials currently used in the field of stone conservation. Without exploring the complex theoretical discussions related to this topic in detail, the article attempts to give a practical outline of current methods. Different dry, wet, and chemical cleaning methods are presented; their basic features are summarized and discussed. Basically, no single cleaning method fits every object, nor should some techniques be categorically excluded.*

**Beate Sipek**

### **The cleaning of murals**

[Die Reinigung von Wandmalerei]

#### **Abstract**

*The cleaning of murals is often regarded as the first, understood necessity in a preservation or restoration project. Before stepping into this, however, questions regarding the material/technique and methodological questions as well have to be solved. The conservator has also to reconsider the ethical implications of his/her measures. In the past, considerations on the grade of cleaning played a minor role, although discussions on the „Alterswert“ [value by age] of a work of art or on patina and dirt already started already in the 19<sup>th</sup> century.*

*The awareness that the whole cleaning process is irreversible and interferes with the historically grown state of a work of art and has to reflect later exposition goals, grew slowly due to scientific research on dirt on artworks and the verifiability of cleaning measures.*

*The requirements for the cleaning of wall paintings do not differ fundamentally from those of other disciplines, but the conservator has to reconsider object-specific parameters, as the architectural context of the murals or their exposure to environmental factors which are not always manageable.*

## **Plastics, latex**

**Sabine Maier**

### **Cleaning of synthetic surfaces made of polyolefins (PE and PP) and polymethylmethacrylates (PMMA)**

[Reinigung von Kunststoffoberflächen aus Polyolefinen (PE und PP) und Polymethylmethacrylaten (PMMA)]

#### **Abstract**

*The state of the art in the field of preservation and restoration of polymer art objects is still to be described as inadequate, especially since the comparatively recent plastic material is subjected to changes in the aging process which is not yet studied and explained in toto. The requirements for the preservation of the material are not yet fully defined because of the lack of criteria based in scientific conservation. In particular, more studies are needed in the chemo-physical changes of aging. It has, however, become apparent that the professional approach and the knowledge about the problem are increasingly understood. The development of solutions should happen in close collaboration with contemporary artists to include their expectations.*

*The establishment of an independent subject with concern to the restoration of contemporary art can be regarded as a sign that the problem is recognized in its scope. Numerous restorations taking also in account the artist's ideas which have to take place before these ageing processes are fully understood and before proper methods are developed, have to be conducted with extreme caution. These often harmful processes include migration and demixing of the polymeric base substance. Additives and softeners migrate in different ways and form a new appearance together with the corrosion and dust deposits. Surface degradation of the amorphous material differs fundamentally from the experience gained from historical materials and techniques: thermoplastics are different. This means, in particular, for cleaning – beyond ethical considerations – that we have to develop new strategies: as shown, cleaning becomes superfluous, in particular, if corrosion and the deposit of dirt and dust is taken deliberately into the artistic statement by the artist. In order to minimize aging and pollution, preventive preservation in the museum area is still the most important form for preserving works of art made of polymeric materials.*

**Dietmar Linke**

### **Cleaning elastomers and hard rubber**

[Reinigung von Elastomeren und Hartgummi]

#### **Abstract**

*As the automobile is the index fossil of individual mechanised mobility of the 20<sup>th</sup> century, rubber is, as mineral oil, an essential material basis for the development of this industrial sector since the second half of the 19<sup>th</sup> century. The preservation of this important cultural and historical material is therefore out of question.*

*On the other hand, rubber lives in the shadows, even in form of hard rubber/ebonite/vulcanite. This brief introduction shows the diversity of the material and the associated complexity of this interesting group of the elastomeric group.*

*Signs of aging and their phenomena on rubber surfaces are pointed out, as well as methods of cleaning are given. Difficulties in preservation and conservation – which cause further research for the treatment of the elastomers – are discussed, and examples for restoration are given.*

**Sebastian Köhler**

**Talcum powder on latex: The cleaning of an artwork by Eva Hesse**

[Talkum auf Latex: Die Reinigung eines Werks von Eva Hesse]

**Abstract**

*Poor adhesive original materials like artificial dirt patina, loose pigments and powders on the surface of modern and contemporary artworks are difficult to preserve. An example for this problematic issue and the related impact for conservation treatments is the object “Seam” by the American artist Eva Hesse (1936-1970). Since 1970, the artwork is part of the collection of Kunstmuseen Krefeld.*

*“Seam” is made of rubber that is applied on a wire mesh support. The rubber coating is strongly deteriorating. The material has become brittle, inflexible and darkened. Due to the color change, a white talcum powder became visible on the surface. Eva Hesse applied it to make the surface less sticky and shiny. In 2008, a larger conservation treatment was carried out. The challenge for the cleaning was an unequal dust and dirt layer on the surface. After tests, the separation from the original talcum application by cleaning was noted to be impossible. This paper discusses the importance of that white powder for the meaning and the authentic appearance of the “Seam” object, reconstructs the decision making path before conservation and describes the related steps of the surface treatment.*

**Eva Bartsch**

**Cleaning plasticised PVC**

[Reinigung von Weich-PVC]

**Abstract**

*The article deals with the problem of cleaning artworks made of plasticised PVC (PVC-P). Most recent dry and wet cleaning methods, to remove migrated plasticizer from the surface, are explained and discussed. At the end of the text a case study is presented.*

**Sarah Jahns**

**Plasticine: A case study in dust gathering of non setting modelling clays – approaches to surface cleaning**

[Plastilin: Ein Fallbeispiel zur Verstaubung dauerplastischer Modelliermassen – Lösungsansätze für die Oberflächenreinigung]

**Abstract**

*This study is concerned with the challenges of surface cleaning of artworks made of non-setting modelling clay. Particularly the danger of mechanical stress through surface contact was referred to.*

*It was conducted by the Academy of Fine Arts, Vienna, by means of an analysis of the plasticine works by the artist group „Gelitin“. The analysis takes into account the soiling of surfaces made of non-setting modelling clay and the requirements of cleaning agents. It presents the results of test series and the subsequent criteria to choose agar-gel that directly gels on the object surface as a cleaning agent. Furthermore, the paper lists possible preventive conservation measures.*

**Katharina Haider**

**The cleaning of silicone rubber**

[Die Reinigung von Silikonkautschuk]

**Abstract**

*This article addresses silicone rubber, its fields of application, chemical constitution and features, its degradation and recommendations on cleaning. The mechanism for obtaining the raw materials for silicones was developed in 1940/41, a first full product line was available in Germany in the 1955 by the Wacker company. With some exceptions the material has become more common as artistic material since the 1990s. Moreover it can be found in*

design collections and in collections of technical or medical objects. Although silicones are being widely used in everyday life, the amount of silicone objects is relatively limited and conservation treatment of silicones has not been a regular challenge so far.

Silicones are synthetic polymers. Their polymer backbone is composed of siloxane bonds Si-O-Si, causing the partially inorganic nature of the polymer, going along with very good thermal stability and resistance to electromagnetic (UV) and corpuscular (alpha, beta, gamma) radiation. In silicone rubber there are usually two organic side groups attached to the silicium atoms, of which methyl groups are the most common. These side groups are highly hydrophobic and shield the siloxane backbone from chemical interactions and render them non conducting. During vulcanisation some of these side groups are used for crosslinking.

Silicones are discerned by different characteristics: by the required vulcanisation temperature (room temperature RTV or high temperature HTV), by the number of components (one or two) and by the polymerisation reaction during vulcanisation (condensation and addition cross-linking). All of them are commonly addressed as silicone rubber though they exhibit considerable differences. For artistic purposes RTV silicones are almost exclusively being used, whilst HTV silicones are more convenient for industrial applications as there are no complications due to premature curing. RTV-1 silicone sealing agents and adhesives have very good adhering properties, while RTV-2 silicones do not adhere to any surface. Many cross-linking silicones contain silicone oil as softener (which can be up to 30%). Especially at elevated temperatures and mechanical stress they are likely to release some of them, which goes along with shrinking and the formation of a sticky film on the surface. If applied correctly addition cross-linking silicones are the most stable silicones. If the vulcanisation process is disturbed the silicone remains permanently sticky due to not polymerised components. Such processing defects become obvious immediately. Due to the non-reactive nature of the polymer chains, additives are loosely embedded into the polymer matrix of silicone.

The cleaning of silicones has not been studied in depth as it was done for petrochemical polymers such as PVC, PMMA, PS and HDPE in the POPART project. Some of results regarding exudation of softeners or lubricants, dealing with static charge and general advise on cleaning plastics can presumably be transferred to silicones. However, more research is needed to verify this.

Miller has shown that organic solvents used for conservation, especially non-polar hydrocarbons result in extreme swelling of silicones and can extract additives easily. The best way to clean silicone is using water and a soft microfiber cloth. Since distilled water is non-conductive, tap water seems to me more suitable to remove electrostatic charges from the surface. If necessary, non-ionic detergents can be added to increase the cleaning effect although they are likely to also remove additives from the silicone matrix. Because of the strong electrostatic charge of silicone it is advisable to use antistatic cloths and brushes or to a discharging gun, if dry cleaning is intended.

## Preventive conservation

**Martina Griesser-Stermscheg**

**Cleaning and preventive conservation**

[Reinigung und Präventive Konservierung]

### Abstract

Dust is an economic factor in the management of collections. After the definition of dust and the agents of deterioration activated by dust the function of dust-analysis for a concept of dust prevention is pointed out. Prevention is better than cleaning, because cleaning procedures can cause mechanical or chemical damage. Finally different methods of preventing dust in museums are illustrated by a few case studies.

**Melanie Bauernfeind, née Eibl**

**Preventive conservation and common cleaning procedures in public buildings**

[Präventive Konservierung und Reinigung von öffentlichen Bauten]

### Abstract

The variety of contributions in this book shows that the cleaning of surfaces of works of art pose different questions. But finally, every attempt to clean a surface still remains a risk for the preservation of materials. Accordingly, the strategy of preventive conservation is to reduce any dirt accumulation. Therefore, the first step is to avoid dirt being carried into the

*building. In consequence, this article does not deal with the cleaning as action carried out in a conservational sense. In fact, the aim is to draw attention to the commercial cleaning of buildings as an area of conflict between running a museum on one hand and dirt or dust prevention on the other hand. Until now, problems caused by commercial cleaning in museum buildings are commonly underrated. This is understandable since cleaning seems to be part of an every day routine. But on closer examination and in the context of preventive conservation there are simple but effective strategies to enhance the preservation of artworks.*

**Paul Bernhard Eipper**

**Preventive Conservation: Harmful substances in depositories, showcases, and transport boxes)**

[Präventive Konservierung: Schadstoffe in Depot-Atmosphäre, Aufbewahrungs- und Transportbehältnissen]

**Abstract**

*The contribution shows that, due to use of different materials in storage and exhibition, museum objects suffer due to ingredients of the surrounding environment. Information on current EU-projects, dealing with contents of preventive conservation. The article discusses several materials in use and evaluates the pollutants next to exhibited, stored and transported objects ("Volatile organic compounds", VOC). Comments currently generally used materials (building materials made of concrete, glass, ceramics, clay, stone, clay, lime and gypsum plasters, metal, floor coverings), points out the hazards caused by wood (carboxylic acids, acetic acid, formic acid, acetaldehyde, formaldehyde) and wood-based materials (wooden sticks, plywood, multiplex panels), esp. wood fiber boards (pressboard, masonite, soft fiber, MDF, HDF) due to their evaporating ingredients. Papers, boxes and cardboard, textiles, plastic products (sheets, foils, molded parts, foams, insulation, cables, sealing compounds, natural rubber or cellular rubber adhesive tapes) and paints are mentioned as material, which can shorten objects lifetime due to processes initiated by the presence of agents of deterioration. Transport box and showcase materials are compared, UV protection methods are given, Integrated Pest Management is discussed. Additionally, the contribution offers references and links.*

## Part 3

### New methods

**Daniela Jacek; Maren Dümmler**

**Cleaning of plastics with soft particle blasting**

[Reinigung von Kunststoffen mittels weichem Feinstrahlen]

**Abstract**

*With the soft particle blasting method, paper, parchment, seal, wood, varnish, metal, glass, and other kind of materials can be cleaned more thoroughly and gently than with common approaches. In the various divisions of restoration and conservation this technique has been established. On plastic objects this method was not already proved.*

*Due to their chemical composition, their manufacturing processes and their different aging behavior, plastics are among the highly sensitive materials in the field of restoration and conservation. So it was obvious to test this technique on various plastics. In this paper the first promising tests on plastics and their results are summarized.*

**Karin Bunz; Raymond Bunz**

**Alternatives to manual cleaning procedures of architectural surfaces and murals**

[Alternativen zur manuellen Reinigung von Raumfassungen und Wandmalereien]

**Abstract**

*Surface cleaning always involves physical processes. Forces have to be applied to detach the adhesion of pollution particles. Generally, in conservation and restoration of art and cultural heritage, it is necessary to keep applied forces as low as possible during cleaning procedures.*

*So far, manual cleaning procedures have been state of the art in most fields of conservation and restoration. However, it has been proven by microscopic and analytical examinations, that they are not gentler than other feasible methods. Physical and chemical processes can be induced by cleaning substances and procedures, so that surfaces could be irreversibly damaged. Although these negative effects have been proven mainly in paper*

and painting restoration, the results can also be transferred to interior settings and wall paintings in architectural monuments. Therefore, the questions of which cleaning method is to be used and which cleaning degree is required, are crucial.

Unfortunately, for architectural surfaces, which are often subject to heavy uses, there is still a lack of objectifiable, repeatable and at the same time efficient cleaning methods. Church halls in particular, are exposed heavily to a broad spectrum of pollutions and are therefore subject to a high frequency of renovations. Even today it is often decided to repaint instead of preserving historical surfaces through professional cleaning. This can lead to technological disadvantages in the long run and historical information and cultural heritage could be lost.

In this article, device-based cleaning procedures are presented from the perspective of objectivity and repeatability with minimal damage to the surfaces at the same time. Basic principles are explained and assistance in the selection of required materials and equipment is given. Possibilities and limitations are illustrated by documented case studies.

### **Katharina Heiling**

#### **The cleaning of murals with *gomma pane***

[Die Reinigung von Wandmalereien mit *Gomma pane*]

##### **Abstract**

*Gomma pane* (Italian: “rubber bread”) is a cleaning dough made from water, flour, copper sulphate and soda. Due to its rubber-like consistency, it is versatile and very good for gentle cleaning of wall paintings on mineral surfaces. It is used for the removal of loose dirt which has been superficially deposited on the surface. The cleaning principle is similar to that of an eraser. *Gomma pane* is particularly suitable for wall paintings with moisture sensitive secco layers (e.g. lime paintings) as well as for all types of secco paintings which are painted on plaster surfaces with water-soluble binders. The *Gomma pane* cleaning dough has to be made fresh in situ. The copper salt in the dough has an inhibiting effect against microorganisms. According to the results of a diploma thesis from 2003, the cleaning dough *Gomma pane* is recommended for cleaning wall painting surfaces and is more suitable than the akapad sponge for example. The dough should be prepared and baked according to the Swedish recipe. (Translation: Elin Lundmark)

### **Laura Peters; Bert Jacek; Anne Sicken**

#### **The cleaning of bird feathers within ultrasonic baths**

[Das Reinigen von Vogelfedern im Ultraschall-Bad]

##### **Abstract**

Experiments were conducted on the cleaning of freshly and artificially soiled bird feathers using ultrasonic cleaning. Different solvents were used, which differed mainly in their surface tension. Water, ethanol n-hexane and, for the first time, Novec 7200 were used. The feathers were treated up to two times. The best results were achieved with ethanol, and with a repeating cleaning with Novec 7200. The surfaces of the feathers were not damaged in the process. Nevertheless, further investigations must be carried out on dyed and aged feathers.

## **Painting**

### **Paul-Bernhard Eipper**

#### **The cleaning of oil paintings on paper, cardboards and cartons**

[Die Reinigung von Ölmalerei auf Papier, Karton und Pappe]

##### **Abstract**

Due to the vulnerable support and the the weak adhesion of the paint, cleaning of oil paints on paper and cardboard has always been a challenge. Due to the capilarity and the increasing acidity of the supporter one has to think carefully about aqueous cleaning. In the example presented – oilpaint on cardboard, around 1930 – whitish glazes on the top of the brushstrokes of the the oil paint have developed over time. Surface examinations with konvocal 3D-laser scanning digital microscopy revealed that the whitish veals are part of the colour and not mould or dirt or varnish. After dry cleaning with moderate preasure the surface shows again the undistrubed paint surface. In order to protect the portrait, the painting received an UV-protection glass pane, mounted in the original decorative frame.

**Bernd Pappe**

**The surface cleaning of portrait miniatures on ivory**

[Die Reinigung von Elfenbein-Miniaturen]

**Abstract**

*The term “miniature” has referred to a number of things in the past. In art, miniatures are finely and very precisely executed paintings in water colours on parchment, paper or ivory. The technique was mostly used for portraits. Being intimate objects, portrait miniatures were often worn by their owners and sometimes looked at secretly.*

*Ivory was introduced as a painting support in c. 1700, because its colour and semitransparency resemble the human skin. Miniatures were painted in transparent and/or opaque watercolour layers without undercoating. The flesh tones are always painted in transparent colours, in stippling or hatching brush strokes to maintain the appearance of the ivory. Miniatures were protected against scratching and dirt by covering them with a slightly convex glass.*

*Gaps between the glass and the painting involve the risk of dirt, small insects or mould to penetrate. Before cleaning, it's important to make sure that the colours are adhering well on the support. Dust and mould as well as insects can be wiped off with a clean, soft paintbrush. Dirt particles solidly adhering to the paint layer may be reduced mechanically with a scalpel under the microscope. Layers of surface dirt can be removed with granulated rubber (avoid kneaded erasers) using a dry cotton swab. The use of solvents may eventually be considered for surface cleaning of miniatures painted on ivory (but not of miniatures on parchment) after making sure that no areas of the paint are sensitive to solvents. Any surface cleaning should be carried out regularly, without creating dirt concentration in matt areas of the paint. Beware of rapidly evaporating solvents: evaporative cooling can cause condensation and soften the paint layers.*

*The difficulties in surface cleaning of miniatures show the importance of protection against any kind of dirt. The covering glass should be attached tightly over the miniature, all gaps between miniature and glass should be closed. Mould is best prevented by regulating the ambient humidity.*

**Kamila Marta Korbela**

**Daylight fluorescent colours – options and restrictions with regard to cleaning and retouching**

[Tagesleuchtfarben – Möglichkeiten und Einschränkungen in Hinblick auf Reinigung und Retusche]

**Abstract**

*Daylight fluorescent pigments absorb and re-emit various light frequencies in the visible and invisible region of the electromagnetic radiation spectrum, generating a significantly higher emission than conventional pigments that can be perceived as ‘glowing’. The preservation of daylight fluorescent paint layers, however, is complicated, as conservation professionals have no routine approach or guidelines for their treatment. Taking the example of a recent treatment of Frank Stella’s ‘Bampur’, possibilities and limitations regarding the preservation of daylight fluorescent paintings are being discussed by means of a theoretical and practice-oriented discourse with focal points concerning surface cleaning and inpainting.*

**Ulrik Runeberg**

**Hardboard as painting-support, artist material and medium for restoration. Historical, characteristic and aesthetic aspects of an industrial wooden composite panel in the arts.**

[Hartfaserplatten als Bildträger, Konstruktions- und Restaurierungsmaterial. Historische, materialimmanente und ästhetische Aspekte eines Holzwerkstoffs in der Kunst]

**Abstract**

*Note: This essay is linked closely to the article “Staining and foxing of acrylic paintings on hardboard” of this “handbook”, part I, by the same author.*

*Soon after the implementation of hardboard during the mid-1920’s, industrially processed fiber boards widely became discovered among artists. The product served as an economical and fairly stable support for paintings worldwide, and also found its way into the field of conservation.*

*Most widely used throughout the 20<sup>th</sup> century had been the standard hardboard panel that characteristically consists of two different surfaces: one structured side which reminds of canvas, and a plane, smooth and glossy surface resem-*

bling wood. It remained the artist's choice which side of the hardboard panel was used – often with profound aesthetic consequences.

The introduction of this wooden fiber-panel led as well to challenges within the field of conservation which include difficulties in consolidation and aspects regarding the cleaning especially of the structured surface.

Consciousness towards hardboard panels as painting supports has increased during the past decades which includes the detection and treatment of typical damages involved, leading to a variety of innovative approaches in the field of surface cleaning of paintings on such panels. The application of poultices and the use of a micro-aspirator (a system known dental surgery) belongs to these approaches, which intend to ensure a safe and effective cleaning result.

Meanwhile, the use of hardboard in the field of conservation (e.g. as a backing board) and also in the arts has dropped significantly. On the other side, this industrial material has become accepted increasingly in art history as well as in conservation science as an authentic and historical component of an art work in its own right.

This contribution deals with a wide range of characteristic damages on hardboard. A special focus, however, is on the verso sides of those painting supports, which may reveal insight not only into the preparations made by some artists previous to their use, but also on the condition, matters of re-use, or even authenticity. Additionally, the author deals with the group of hardboard panels painted “recto” and “verso”.

## Archaeology and Works of art

**Harald Theiss; Miguel González de Quevedo-Ibañez; Sonia Tortajada-Hernando; Wolfram Kloppmann; Martin Cooper; Guillaume Wille**

### **Options of cleaning of untreated alabaster**

[Möglichkeiten der Reinigung von unbehandeltem Alabaster]

#### **Abstract**

*The text introduces alabaster with its typical material properties and gives an overview of historical and contemporary methods of cleaning alabaster in restoration. Each cleaning method was tested in practice on samples and evaluated for their applicability under current restoration standards. Based on the gained results, a favorite cleaning method has been developed: the cleaning of alabaster by laser in combination with agar-gel-compresses based on calcium sulphate-saturated water. The two working steps are presented and discussed in detail. On the basis of practical tests, precise instructions have been developed on how to carry out this form of cleaning. Finally, the necessity of coatings, which are often used after the cleaning of alabaster, is discussed.*

**Gergana Almstädter; Walter Prenner**

### **Recovery and cleaning of archeological ceramics from the Hallstatt burial site**

[Bergung und Reinigung archäologischer Keramik aus dem Gräberfeld von Hallstatt/OÖ]

#### **Abstract**

*The pottery found at the Early Iron Age cemetery of Hallstatt is of cultural importance but extremely fragile and mainly in very bad condition according to porosity, brittleness and state of fragmentation. This is due to the manufacturing technique (firing at low temperatures) and the deposition circumstances in soil (caused especially by strong temperature differences in the high valley, stonefalls, relocations, destruction by roots of trees). As a result, most of the ceramics as well as the bone material were not picked up during the excavations in the 19th cent. and are therefore lost for research and exhibition – apart from sparse schematic drawings in watercolors by Ramsauer.*

*The Department of Prehistory at the Natural History Museum Vienna has been carrying out archaeological excavations in the area of the prehistoric Hallstatt cemetery again since the 1990s, led by Anton Kern. With regard to the numerous ceramic finds from the burial ground, it was necessary to develop a specific method for the recovery and cleaning of these artefacts in order to guarantee an optimal quality of conservation and presentation.*

**Paul-Bernhard Eipper**

**Cleaning, coating and conservation of objects made of silver**

[Objekte aus Silber: Reinigung, Beschichtung und Bewahrung]

**Abstract**

*Even in our days cleaning of silver objects is executed in very different ways all over the world. Surfaces of archaeological (excavated) objects and objects from the past five centuries were treated quite differently. The extent of cleaning treatment is varying from decade to decade, from collection to collection and even in collections we can find astonishingly different results. Cleaning fashions and historic traditions and possibilities are discussed. After a review of historic and contemporary cleaning practices of silver surfaces and the therefore used materials, several possibilities of cleaning treatments (mechanical, chemical, laser) are discussed as well as the theme "how far should cleaning go". The practice of coatings (nitro cellulose, acrylates, wax) and problems caused by this practice, as mentioned in the recent literature and executed in our times is summarized, merits and limits are discussed. The article gives additionally examples of contemporary storage and presentation of silver objects, useful and hazardous materials for display and depository.*

**Irina Marilyn Huller**

**Remarks on the uncovering of archaeological silver**

[Zur Reinigung von archäologischem Silber]

**Abstract**

*This paper is an excerpt from a diploma thesis and gives an insight into the cleaning of archaeological silver objects. In the case of the fluted silver bowl from the collections of the Kunsthistorisches Museum Vienna, it was intended to preserve the black silver sulfide surface, for both aesthetical and conservation reasons. Only the hardened silver chloride corrosion layers with incrustations were to be removed. An iron support, on which the three largest fragments of the bowl were mounted, caused further damage to the silver artefact. Neither the surface nor the fragments themselves should suffer any damage during the reduction of the corrosion layers. A method combining chemical and mechanical cleaning approaches was developed. Compresses of short cellulose fibers soaked with a complexing agent were used to chemically reduce the different corrosion products of silver chloride, sediments and rust. The unwanted layers could then be successfully removed mechanically, using fine tools, and a homogeneous surface was achieved.*

**Gergana Almstädter; Karina Grömer, Anton Kern; Hans Reschreiter**

**Post-cleaning treatment of preserved organic textiles from archaeological contexts**

[Behandlung von organisch erhaltenen Textilien aus archäologischem Kontext nach der Reinigung]

**Abstract**

*Textiles from archaeological contexts require specific treatment, as they have been embedded into the soil. In this contribution, we are focusing on organic textiles like those embedded in bogs, ice or salt (opposed to mineralised textiles that are found in graves), as case study we present textiles from the prehistoric Hallstatt salt mine. Here we focus on an efficient and considerate method for drying the artefacts after cleaning treatments. It is the aim to preserve the primary shape of the object as it might have been before embedding into the soil (or, in this case: salt rock). Uncontrolled deformation of the textile objects during the drying process has to be avoided. Additionally, in some cases there are specific features among the textiles such as threedimensionality or some features that have been caused by the users of the textiles in prehistory (e.g. specific folding) shall also be visible after drying.*

**Britta Schmutzler; Nicole Ebinger**

**The cleaning of archaeological finds**

[Die Reinigung von archäologischen Fundobjekten]

**Abstract:**

*This paper introduces shortly into the main issues of material corrosion in case of archaeological objects and the resulting implications for their cleaning. The conservation of the objects in their state of condition at the time of*

excavation and the maintenance of that material leads to special cleaning techniques, storage strategies, conservation treatments and preventive conservation measures, which are outlined shortly. Techniques are given for ceramics, vitreous materials, metals and biogenic materials which are found mainly in Middle Europe. Cleaning has to be considered as a standard treatment step, but as well its impact and consequences for the long time preservation of archaeological cultural heritage.

**Andrea Fischer; Christina Peek**

**The potential of Investigative Conservation: A contribution to the cleaning of archaeological objects**

[Investigative Konservierung: Erkenntnispotential und Informationsgewinn. Ein Beitrag zur Vorgehensweise bei der Reinigung archäologischer Objekte]

**Abstract**

Nowadays, our approach to cleaning archaeological metal finds from graves is characterized by the concept of Investigative Conservation. The aim of this approach is to recognize, to record and to interpret as much relevant information as possible, using appropriate examination methods and minimal invasive interventions. The context of the findings, as well as mineralized organic materials, gain special relevance as a valuable source of information. A complete cleaning of the "original" surface is carried out only in exceptional cases.

**Appendices with additional hints**

**Appendix I:**

**Paul-Bernhard Eipper**

**Schoenfeld, Schmincke, Wagner and Schall: manufacturers of artists' colours and painting material between 1900 and 1970**

[Die Künstlerfarben- und Malmaterialhersteller Schoenfeld, Schmincke, Wagner und Schall zwischen 1900 und 1970]

**Abstract**

Examples of artists' color materials produced 1900-70 in Germany by Schoenfeld (Dusseldorf), Schmincke (Dusseldorf), Wagner (Hanover and Vienna), and Schall (Hohenacker) are shown by means of historical catalogs. The popular products of Schoenfeld and Schmincke were used by until today wellknown artists, such as Andreas and Oswald Achenbach, Vincent Van Gogh and Egon Schiele. But even not popular artists (examples are given) used these materials August Deusser, Norbertine Bresslern-Roth. The archives of the main producers of artists' colors have been opened for this examination. Ingredients of the painting materials produced by Schoenfeld, Schmincke, Wagner (Pelikan), and Schall are given, and differences between the oil paints are pointed out.

**Appendix II:**

**Paul-Bernhard Eipper**

**Remarks on the cleaning of alkyd resin paints**

[Zur Reinigung von Alkydharzfarben]

**Abstract**

Since the third decade of the 20<sup>th</sup> century, decorative gloss paints have been used by numerous artists. Unfortunately the fact that artists, museums and galleries do not call alkyd resin paints by their name, we found mostly „oil/canvas“-descriptions in catalogues and only sometimes „enamel paint“ (a misleading term). Mostly these paints were not identified and analyzed before treatments. Therefore these paints were treated in the same way than oil/resin/beeswax colours. Due to the developments made in the gloss paint industry as well as artists practices, it is difficult to interpret the ingredients and behaviour of alkyd resin paints. The production of alkyd resin paints is explained, artists using this paints, as well as mixing practice of these colours are given. Specific examples of alkyd resin paints found on works of art, details about handling and cleaning of alkyd resin paints are given as well.

### Appendix III:

**Paul-Bernhard Eipper**

#### **Proper tensids and improper convenience products in conservation**

[Geeignete Tenside und ungeeignete Fertigprodukte in der Restaurierung]

##### **Abstract**

*Surveys the different groups of surfactants and defines related technical terminology. CMC, MFT, EO/mol, HI, HLB, Zein are explained in detail. Historic surfactants (such as bile, photo wetting agents, detergents, soaps, saliva, saponin) used mostly by restorers around 1990-2012 are described. Hazardous surfactants to be avoided are listed. For comparison special references are made to the anionic sodium dodecyl sulfate (SDS) and the nonionic Marlipa® 1618/25 powder (EMULDAC/AS-25 SC). The practice of wet cleaning with tensile surfactants in aqueous medium is described. Possible additions for wet cleaning systems are given. The reasons that anionic surfactants can harm proteinaceous binding systems of colors and that nonionic surfactants can harm oil paint are explained. For a useful preselection it can be concluded that conservators should only use unbranched – linear – regular structured surfactants, which are colorless and chemically stable and should be dry at room temperature (HI around 1). The chain length of the carbon chain should range between C14 and C18. The surfactant should not have to be added in large quantities to the cleaning solution and should be pH-neutral in a concentration capable of forming micelles (max. pH 6-8). With a value of up to CMC (around 30mM) the surfactant should ideally be nonionic in character. In the case of the use of fatty alcohols (chain alcohols, anionic surfactants), the amount of free saturated fatty alcohols must not exceed 1, i.e. to be 1, better <1. The HLB value (according to Davies) should be around 13-15. The zein value should range between 200 mg N2 / 100 ml and <200 mg N2 / 100 ml. The ethylene oxide content should not be beyond 10 EO / mol and therefore better to be higher (e.g. ideal at 25 EO / mol).*

### Appendix IV:

**Moritz Geissmann**

#### **Polyvinylformal cleaning sponges (formally known as „PVA sponges“): soluble components and usage in conservation**

[Polyvinylformal (PVF)-Reinigungsschwämme (bisher bekannt als „PVA-Schwämme“): lösliche Bestandteile und Verwendung in der Konservierung – Restaurierung]

##### **Abstract**

*The term “PVA sponge”, as a reference to polyvinyl alcohol, has become incorrectly accepted. The sponges are proven to be made of polyvinyl formal (PVF). In two series of tests, three so-called “PVA Sponges” used in conservation practice (“Super-Saugschwamm”, “Blitz-Fix” and “Saugwunder”) are examined for their optically determinable soluble components. The results show that washing out with deionised water is only suitable for further use with water. If further additives such as surfactants are added, the sponges should also be placed in this solution for 24 hours and then rinsed out to ensure that all soluble compounds are removed. Another possible solution could be cleanroom quality sponges without soluble additives.*

### Appendix V:

**Paul-Bernhard Eipper**

#### **Imaging and measuring of surfaces with new 3D laser scanning digital microscopes**

[Aufnahmen und Messungen von Oberflächen mit 3D-Laserscanning-Digitalmikroskopen]

##### **Abstract**

*Describes the development of surface examinations of painted surfaces between 1990 and 2020. Points out merits and limits of scanning electron microscope, computerassisted laser-profilometry, environmental scanning electron microscope, 3D-stripe projection based on micromirrors and the confocal 3D-laserscan microscopy.*