

## Ein gefährdetes Kulturgut

## Neue Perspektiven für die Konservierung von Goldleder in den Niederlanden

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## **Gilt leather, an endangered cultural heritage**

### **New perspectives for gilt leather conservation in the Netherlands**

#### **Teaser**

*The 'Golden Age' for gilt leather in the Northern and Southern Netherlands was in the 17<sup>th</sup> and 18<sup>th</sup> centuries. Unfortunately much of this material, even though it once had a similar fame to Delftware, has been lost through a variety of factors, including renovations, material degradation and limited knowledge in applying conservation treatments. The current generation of (technical) art historians, conservators and scientists are working together to ensure the preservation of these objects and their cultural meaning for future generations.*

#### **History of gilt leather**

Gilt leather originated in the North African city of Ghadames, nowadays Libya, and was introduced to the Iberian Peninsula in the early Middle Ages. The migration of Moorish craftsmen brought gilt leather making skills first to Italy and France in the 16<sup>th</sup> and 17<sup>th</sup> centuries, then to the Netherlands, Germany and England. The 'Golden Age' for gilt leather in the Northern and Southern Netherlands was in the 17<sup>th</sup> and 18<sup>th</sup> century.

Gilt leather is a decorative material mainly used for wall hangings in high-status public buildings, palaces and stately homes. It has also been applied to a variety of objects, including folding screens, chairs, suitcases and plaques, and in church and synagogue settings, see for example gilt leather as a decorative feature in the Portuguese Synagogue, Amsterdam (Figure 1). Gilt leather consists of a leather structural backing layer which is first covered with a thin layer of silver overpainted with a yellow or orange-brown oil-resin varnish to give the gilt appearance. Further decoration is provided by embossing, stamps with geometrical patterns, and additional painting with coloured pigments in different pictorial styles, according to location and period, and occasionally by adding wool flock.

In Europe the major production centres were in Cordoba in Spain, Venice in Italy, Mechelen in the current Flemish region of Belgium and Amsterdam in the Netherlands. Local archives hold important documents about the workshops in these cities. In the Netherlands, smaller centres of production existed in Dordrecht, Haarlem, The Hague, Middelburg, Utrecht and Vreeland (Figure 2). According to local traditions and regulations, gilt leather makers were part of the guild system. In Spain for example, gilt leather had its own guild, and in Venice and the Hague, gilt leather makers were part of the St. Luke guild. From Venice interesting collaborations with painters are known. Further details of gilt leather production techniques are well described in the existing literature (Schulze 2011).

Before the 18th century, gilt leather was mainly used as a temporary wall hanging in the houses of the extremely wealthy. It was hung loosely on leather loops in the grand rooms and when not in use, rolled and stored. As gilt leather became more affordable, it was more widely used and was often tensioned and fixed permanently between wainscotings. Gilt leather wall hangings can have repetitive patterns, similar to modern wallpaper, or similar to paintings, depicted with scenes, usually from the bible, classical scenes and landscapes. The ornaments and styles tended to follow contemporary stylistic trends. The auricular style for instance, was very fashionable in the

Netherlands in the second quarter of the 17<sup>th</sup> century. Dutch 17<sup>th</sup> century gilt leathers were decorated with colourful, bold naturalistic motifs, such as flowers, leaves, birds and animals, often without a well-defined orientation. Common themes were allegorical or mythical figures, the five senses, the four seasons, the four elements and Vanitas symbols. By the end of the 17<sup>th</sup> century, a style change to symmetrical, non-embossed designs occurred, reflecting French influence in the decorative arts and architecture in this period. Koldeweij (1998) provided further detail on the history of gilt leather in the Netherlands.

### **Material dynamics**

Gilt leather consists of a leather support with a thin layer of silver, covered with coloured varnishes and paints. These are very much different materials with different mechanical properties.

The leather support originates from different types of animal hides as calf, goat and sheep, depending mostly on the region of production. Animal skin is composed of collagen molecules built up from polypeptide chains in a triple helix structure. The mechanical and aesthetic properties of the leather vary, based on the animal species and the quality of the tanning. Animal skins are prepared by a chemical tanning process imposing major changes in the chemistry and structure, leading to improvements in durability, and resistance to water and biological attack. Before the 19<sup>th</sup> century, vegetable tannins from plant products such as oak bark, chestnut, sumac and myrobalans were used, modifying the leather with hydrolysis processes.

Degradation processes of historical leather are complex and may be caused by environmental conditions (incorrect temperature, relative humidity and atmospheric pollutants), by components of the leather-tannin complex itself, or by chemicals introduced during the production of the leather. Degradation processes result in a depolymerisation and reduced cohesion of the leather fibres, a lower mechanical strength, a lower pH and a change in colour (Larsen 1996, 2000).

Tarnishing of the silver leaf is a frequently observed phenomenon on historic gilt leathers. It shows as a local darkening or even blackening of the surface. Silver reacts with atmospheric pollutants such as hydrogen sulphide to form silver sulphide. Similarly silver reacts with chloride ions, present in coastal regions or from contact with human skin, to form silver chloride. Depending on the reaction process the extremely thin silverfoil may discolour to red, grey, green, brown or black. Normally the silver is protected both by the glue and the 'gold' varnish layer, but may become cracked from aging and tooling, especially when the gilt leather has been punched or embossed. There are many internal factors that may influence corrosion processes in gilt leather, such as acidic tannins in the leather, sulphur or copper containing pigments from paint layers, or certain oils applied to the leather during past conservation treatments. Environmental influences such as atmospheric gaseous pollutants, moist and high levels of relative humidity, and uv-radiation could be of significance as well.

The oil-resin varnish that forms the shiny golden surface on the silver is composed of a heat-bodied linseed oil, pigments, colourants and resins. Little is known about the degradation processes of these oil-resin varnishes in the specific application of gilt leather. Gilt leathers were painted with similar pigments to those used for canvas and panel paintings. Much research has been performed on these materials for painting conservation (Van Loon et al. 2012).

Environmental conditions also play a role. Leather is a hygroscopic material that exhibits a gradual dehydration over time due to hysteresis from relative humidity (RH) cycling. In addition, high RH levels may create shear stresses between the leather support and decorative layers and the risk

of biological damage due to mould growth is higher above 70% RH. Increases in temperature above ambient are estimated to halve the object's lifetime for each 5°C temperature rise (Michalski 2015). Light is an important agent of the deterioration of gilt leather with ultraviolet radiation imposing a particular risk as it induces chemical changes, leading to brittleness and fading of the paint layers. Atmospheric pollutants also play a role, as described above.

There are some examples of interactions between the components of gilt leather. The crack patterns found in the paint layers are due to interactions between the different expansion and elastic properties of the paint, resin and leather components (Moroz 1995, Schulze 2011). Moroz also showed that crack patterns can be related to the blood vessels in the calf skin.

### **Conservation Challenges**

The starting point is that most gilt leather objects are not in their original condition anymore and only few original complete rooms survive. The majority has been lost. For example none of the 60 rooms decorated with gilt leather from the Rapenburg, one of the main canals of the city of Leiden, the Netherlands, have survived. Gilt leather artefacts moved to museums for safe keeping also became damaged due to previous conservation treatments. Craft-led conservation practices suitable for leather objects such as applying an oil dressing, have unfortunately in many cases caused stiffening of the leather and swelling, softening and migration of the varnish and paint layers, leading to loss of clarity in the pictorial layers and enhanced chemical degradation. Many gilt leathers have seen repeated re-sewings of seams, each time introducing new perforations weakening the leather. Some gilt leathers have had seam strips removed at the edges and others have been lined in its entirety. Lining of a complete gilt leather hanging is not performed nowadays as it is too invasive. During the 1960's lycra® strip linings for flexible mounting were introduced. These performed well for a number of years, but due to aging of the lycra®, they now cause serious problems and are in need of replacement (Figure 3).

The tensioning of leather wall hangings is one of the challenging aspects for in-situ preservation, especially in historic buildings without strict museum climate control, such as palaces, castles, town halls and churches. In these buildings the temperature fluctuates, sometimes over short timescales, according to the outdoor climate, internal heating and numbers of visitors. Tensioning is addressed by flexible hanging systems, e.g. Schulze (2004) and Nijhof Asser et al. (2014) (Figure 4).

### **Expert Meeting 2016, Maastricht**

The authors of the article work together on the NICAS Gilt Leather project, supported by the Netherlands Organisation for Scientific Research (NWO) under the Netherlands Institute for Conservation, Art and Science (NICAS) initiative. This funding supported a symposium and expert meeting on gilt leather at Stichting Restauratie Atelier Limburg (SRAL) in Spring 2016 (Figure 5). The symposium programme consisted of a morning session with presentations by the Gilt Leather project team and an afternoon session with international invited speakers presenting their research in gilt leather and related techniques. The symposium was attended by approximately 60 persons from 11 countries: conservators, scientists, art historians, students interested in gilt leather and even a maker of gilt leather. The conclusions of the day were that gilt leather community is small, enthusiastic, and further cooperation in sharing of information is highly desirable.

The expert meeting, held the next day, was composed of discussion sessions on the themes of *'Technical Art History'*, *'Material Dynamics'*, *'Conservation Challenges'* and *'Diagnostics'*. In the theme *'Technical Art History'*, the main conclusions were to perform state of the art technical analyses on pristine objects from a broader European context: in original location, well documented, little restoration interventions. Technical data should be connected to archival studies of the major production centres: Mechelen, Venice, Cordoba by studying inventories, movement of crafts and the connection between workshops. A database of technical data, archival and source research is much demanded.

Under *'Materials Dynamics'* it was found concerning that the aging process is not well known nor understood. Sometimes different leather panels in a room are aging at very different rates. Moisture, heat, light and pollutants are considered important factors, but with a complex relationship to the animal type and tanning process. There are examples of the degradation of the individual materials in gilt leather in the literature, including leather fibres, silver leaf, adhesives, oils, paints and varnishes. Less well known are the interactions between the leather and residual tanning chemicals with the silver leaf, pigments, oils and varnishes. The relationship between aged materials, tensioning in the hanging system, indoor climate and mechanical damage requires further study.

Cleaning and dealing with the effects of past conservation treatments were defined as the highest priority for *'Conservation Challenges'*. There is extensive literature about how to go about cleaning in general, however these methods may not be appropriate for gilt leather. This makes it difficult for conservators to select safe cleaning methods for gilt leather. The second major issue is dealing with past treatments. Old linings, re-varnishing or oil and wax treatments may have altered the object permanently and may have caused gilded leather to darken. Last but not least, the loss of the flexibility of old leathers remains an issue in gilt leather conservation, with currently no satisfying solution available.

The expert meeting also considered the theme of *'Diagnostics'*. The latest generation of instrumentation allows some technical art history and conservation topics to be investigated in more depth. For example identifying the type of animal the leather is made from (cow, goat, sheep), Peptide Mass Finger Printing (PMF) can be used. In particular it was considered important to identify specific materials, adhesives, protective layers, and metal leaf composition, this to understand material origins and trade roots. More detailed information on the stratigraphy of gilt leather could now be gained using optical coherence tomography (OCT), a technique originally developed for medical applications and spectral distributions can be mapped with hyperspectral imaging.

## **Perspectives**

Summarising the research so far, it remains clear that much has to be done to understand the various aspects of gilt leather. Many gilt leather objects are in a perilous condition, or have already been lost. Due to the small size of the gilt leather community, it is really important to cooperate both nationally and at an international level to build up knowledge and experience. Ideally a digital platform should be formed with information on production techniques, the effects of successful and less successful conservation methods, databases of materials and patterns, and access to diagnostic equipment and willing scientific experts to support the heritage activities.

In conclusion it is important to raise the awareness of gilt leather as being an endangered part of our cultural heritage. One cannot fail to be impressed by the play of colours and reflections from well preserved gilt leather objects when seen in reality. A visit to a complete room in original

state can hardly be described. We encourage the reader to seek out gilt leather objects in your local museums and your travels.

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### **Information Box**

In September 2016 the book 'Gilt Leather Artefacts. White Paper on Material Characterization and Improved Conservation Strategies within NICAS' has been published by the authors of this article. This elaborates on the topics presented here, and sets out the research direction for NICAS for gilt leather for the period 2017-2025. Further information is available at the project website: [www.lr.tudelft.nl/giltleather](http://www.lr.tudelft.nl/giltleather).

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### Figure Captions

Figure 1. (a) The Hechal of the Portuguese Synagogue, Amsterdam and (b) close-up of the gilt leather lining decorated with a flower pattern in wool flock (1675, Southern Netherlands). Source RCE 2002.

Figure 2. (a) Centres of historical gilt leather production in Europe. (b) Centres of gilt leather production in the Netherlands in the 17th and 18th centuries. Source: Koldeweij 1998.

Figure 3 shows (a) a lycra® strip lining for a flexible mounting system for one of the gilt leather wall hangings in the Frans Hals Museum, Haarlem. (b) The flexible hanging system with lycra® installed in 1974 by Henk van Soest, Sint Pietershof Hoorn. (c) The removal of the Lycra® strip lining of the Sint Pietershof wall hangings in 2011 by SRAL, Maastricht, before installation of a new flexible mounting system. Source: Martine Posthuma de Boer (a) and Elizabet Nijhoff Asser (b,c).

Figure 4. (a) is a wooden panel with integrated flexible mounting system, for one of the gilt leather panels of Heeswijk Castle. Design by Godfried Brands, 2013. (b) is the climate and displacement monitoring system, designed and installed by Elizabet Nijhoff Asser at the manor house of De Wiersse, Vorden in 2015. Source: Godfried Brands (a) and Martine Posthuma de Boer (b).

Figure 5 (a) shows presentations to speakers at the symposium, (b) the technical art history discussion at the expert meeting, chaired by Dr. Margriet van Eikema-Hommes and (c) the expert meeting round-up session, chaired by Dr. Roger Groves. Source: the authors.