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# SAINT-MAURICE

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## OBJECTIVES

To develop an innovative electrolytic cleaning method for the restoration of masterpieces of goldsmith Treasury of the Saint-Maurice Abbey (VS, Switzerland).

## PROGRAM

In 2015, the Saint-Maurice Abbey will celebrate its 1500<sup>th</sup> anniversary. The Treasury of the monastery will be redistributed into a new space and the most remarkable silverware (made of gilt or non-gilt silver, which is atmospherically tarnished) will have its original brilliance returned.

Because of the number of artefacts to restore and their fragility a decision was made to treat each composite artefact as a whole without disassembling the different elements.

The Applied Research and Development Division of the Haute Ecole Arc Conservation-restauration (HE-Arc CR) was contacted by the restoration workshop of the Abbey to solve this important conservation issue and a research project was setup to develop an innovative electrolytic cleaning method that could be used without any risk on these prestigious artefacts.

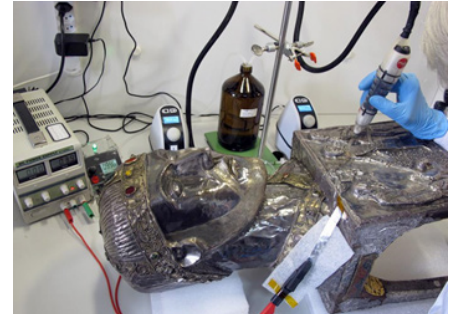
This electrolytic treatment is using "The PLECO", a pencil equipped with a three-electrode cell closed by a micro-porous pad at its extremity, the metal piece to clean being the working electrode.

The electrolyte is constantly renewed from a reservoir using membrane pumps that ensure the forced input and extraction of the solution. The cleaning consists in the reduction of the silver tarnish followed by the oxidation of the reduced silver in the case of gilded silver artefacts.

The PLECO is portable, easy to use, and its ergonomics has been optimised to make it a comfortable tool. The PLECO is a device with all the elements manufactured in the closest FabLab (short for Fabrication Laboratory) as a kit ready to assemble.

Therefore, the PLECO is a media used to build-up knowledge around our discipline, facilitating a multi and interdisciplinary approach.

Additionally, electrolytic parameters (cathodic potentials to apply) could be determined for each plate to adapt the cleaning process : silver chloride tarnish is reduced at a less negative potential than silver sulphide and the duration of the reduction process depends on the tarnish thickness.



## FUNDING

HES-SO, Réseau de Compétences Design et arts Visuels.

## PROJECT LEADER

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## PARTNERS

Saint-Maurice Abbey of Agaune, (VS);  
Institute EDANA, HE-Arc Ingénierie;  
FabLab, Neuchâtel; Institute of Art History, University of Neuchâtel;  
C2RMF, Paris; Arc'Antique, Nantes.

## DURATION

24 months  
2012-2014

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### PROGRAM

The tarnish removal was carried out at constant potential and the reduction current was monitored versus time (chronoamperometric plots).

The PLECO was moved by hand (dynamic mode) from one plate to another in order to clean first silver chloride tarnish and eventually silver sulphide tarnish. By doing so, we could prevent any risk of overcleaning (hydrogen embrittlement) on these medieval silver plates that are often heavily cracked.

### RESULTS

The PLECO has successfully been used on some masterpieces of the Treasury of Saint-Maurice Abbey. In static mode, voltammetric curves were systematically plotted on all plates of the same artefact to map precisely the nature and the level of tarnishing.

### USEFUL LINKS

The PLECO has been designed as an open source tool that should benefit from any improvement provided by end-users that share any new development on the [web page](#) of the PLECO.

- [Final report](#) and [Annexes](#)

