Sciences for art: Preservation and protection of cultural heritage objects

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Conservation and preservation of historical monuments as well as of single artworks of our cultural heritage are receiving increasing attention. In the online magazine ChemViews, Austrian scientists take a view on the current technologies used for scientific analysis and documentation. Portable instruments, a combination of noninvasive spectroscopic techniques, and especially designed weathering cells will provide the data needed to develop strategies for better artwork preservation, they propose.

In artwork analysis, noninvasive techniques such as X-ray radiography, infrared photography and X-ray fluorescence allow the detailed investigation of the chemical composition of, e.g., historical paints. Knowledge of these data surely satisfies our curiosity—is this blue color made of Prussian Blue or indigo? How much lead white was used in historical pigments? It also enables the scientists to assess the deterioration paths of the pigments and materials over time, an issue that has gained increasing attention in recent times.

Manfred Schneider, Rita Wiesinger, and Wilfried Vetter from Vienna University of Technology and the Institute of Science and Technology in Art (ISTA) in Vienna, Austria, have reviewed the state-of-the-art technology used for the documentation and analysis of pigments and dyes in paintings as well as of metals and their alloys or stone in sculptures. They conclude: "Scientific investigations are indispensable for studying material degradation processes on heritage objects."

Especially designed weathering cells enable the scientists to monitor the dynamic degradation of metals and polymers in time-lapsed mode. For the observation of long-term atmospheric corrosion, racks are used with the model samples mounted on it, which will be exposed to the ambient atmosphere. This analysis still needs observation times of years. Apart from the characterization of historical pigments and paints, a recent focus has also been laid on modern paints such as the widely used acrylic colors.

Photographic techniques using X-rays and infrared reflectance technologies nowadays enable scientists to visualize underdrawings and retouches in valuable paintings without any physical sample taken from the object. These technologies are also used for noninvasive material analysis. However, compounded pigments and organic dyes are still difficult to detect with the standard techniques. The authors therefore promote "Science for Art" as a growing research area with the need to develop advanced analytical tools for better assessing the long-term dynamic behavior of the materials. This will provide us with the clues of how to preserve the objects of our cultural heritage.

More information: Manfred Schreiner et al, Identification and Preservation of Cultural Heritage, *ChemViews* (2017). DOI: 10.1002/chemv.201600066

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