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von

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## **Optical Coherence Tomography for examination of cultural heritage objects**

Donnerstag, 22. November 2018, 16:00 Uhr

Akademie der bildenden Künste, Augasse 2-6, 1090 Wien

Hörsaal H 4.40  
(Kern C, 4. Stock)

## Optical Coherence Tomography for examination of cultural heritage objects

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### Abstract

This year marks the fifteenth anniversary of the first announcement of use of Optical Coherence Tomography (OCT) for examination of artworks in the service of restoration/conservation. Soon later, OCT appeared at the Lacona conferences for the first time, at 6<sup>th</sup> meeting held here, in Vienna.

OCT is an optical interferometric technique originated from medical diagnostic. It is worth mentioning here that the most popular and matured version of the technique was invented by Prof. Dr. Adolf Fercher at the Medical University of Vienna, where he chaired the Institute of Medical Physics in 1986–2008. OCT makes it possible to determine the internal structure of objects absorbing or scattering light moderately. Because infrared light with low intensity is used, the technique is safe for all types of objects of art. The results are usually shown in a convenient manner of cross-sectional views, similar to microscopic images of cross-sections of samples – modality very popular among the community of conservators. The technique is fast – registering of one cross-section takes a fraction of a second. Axial resolution is usually not better than 2 micrometres, but the lateral span of the image typically exceeds 10 mm. This results in a better representativeness of the examination and also enables analysis of medium-sized defects, such as cracks. An obvious disadvantage of this technique is the limited permeability of tested media which results in limited penetration in the object. In the case of easel painting, one can usually analyse varnishes and glazes only.

In this presentation, an introduction to the technique for non-physicists will be given first. Next, the ability of OCT to visualise the structure of various types of works of art (easel paintings, stained glass, jade, ceramics and others) will be discussed. However, the most of the lecture will be devoted to the next phase of implementation of the technique, when in response to the demands of conservators and restorers, some more practical applications of OCT emerged. They can be divided into two general categories: pure OCT structural examinations aimed at documenting the state of preservation of the object by detection

cracks, delaminations etc., as well as detecting traces of former restorations and alterations (such as secondary varnishes, presence of overpaintings, putties, and other secondary materials). The second, vigorously emerging category includes the results obtained by combining OCT with other non-invasive and micro-invasive techniques such as MaXRF, FTIR, and LIBS. All this will be presented using examples from our laboratory where physicists responsible for technology development and art restoration specialists from the Institute of Art Conservation Science, Faculty of Fine Arts of our University cooperate on a regular basis.

### CV

Piotr Targowski received his PhD and Dr. Habil. degrees from Nicolaus Copernicus University in Toruń, Poland, where since 2013 he is a full professor of optics and informatics. Since 2001, his main research field is Optical Coherence Tomography and its applications: first in ophthalmology and then in 2003 he proposed using OCT for non-invasive examination of objects of art. In particular, his research deals with the analysis of the order and origin of semi-transparent layers such as varnishes, lacquers and glazes, control of varnish ablation by OCT, analysis of structure and range of surface corrosion processes in historic and stained glass, use of OCT profilometry and analysis of structure and extend of degradation of parchment. Recently, the focus has been on combining OCT with other analytical techniques such as MaXRF, FTIR spectroscopy and LIBS.

Piotr Targowski moderates a <http://www.oct4art.eu> website dedicated to all interested in the application of OCT for the examination of works of art and is the President of Polish Research Consortium for Heritage Science - ERIHS.PL.

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