RI/04

S2-ART

Role and long-term evolution of metalsulfides in paintings

DURATION OF THE PROJECT
01/05/2012 – 30/04/2016

BUDGET
996.160 €

KEYWORDS
paintings, metal sulfides, degradation, museum environment,aerosols

CONTEXT

Cultural Heritage has been defined by the UNESCO as « the entire corpus of material signs – either artistic or symbolic- handed on by the past to each culture, and therefore, to the whole of humankind ». Being the vehicle of our cultural identity, it is our responsibility to set its preservation as the corner stone of our cultural policies[1] .

Our atmosphere has changed from pre-industrial times to our days. Particulate matter distribution and pollutants have evolved according to natural events but majorly due to anthropogenic activities. In any case, they have been incorporated to works of art mostly reinforcing their degradation processes.

Sulphide-based pigments may be noted on the list of endangered materials of Cultural Heritage Objects; their frailty due to their high reactivity, diminishes greatly their long-term durability and value.

[1] *Draft Medium Term Plan 1990-1995 (UNESCO, 25 C/4, 1989, p.57)*

PROJECT DESCRIPTION

This research project proposes the study of the long-term evolution and degradation of metal-sulphides in painted works of art subjected to different atmospheric conditions.

Objectives

The objectives are to study chemical degradation processes at the surface of paintings, to assess the impact of aerosols on metal sulfide pigment, to document the effectiveness of specific measures to modify museum atmospheres and to refine preservation protocols for outdoor art containing these pigments.

Methodology

The methods employed will include a number of standard characterization protocols and tools (e.g., Scanning Electron Microscopy coupled to Energy Dispersive X-ray analysis, Raman micro-spectroscopy, proton-induced X-ray emission, several dedicated forms of gas analyses and soot determination by aethalometry) for atmospheric aerosols with preference for non-destructive and non-invasive procedures.

The degradation of paint layers encountered in the work of painters of the late 19th C. and early 20th such as Ensor and Van Gogh will be a central theme while also paintings of earlier periods (e.g., the Baroque, the pre-Baroque era) showing clear degradation phenomena related to metal sulfides will be studied.

INTERACTION BETWEEN THE DIFFERENT PARTNERS

The project partners will each introduce their own expertise into the project in mutual interaction: P1 (UA) will mainly focus on the study and modelisation of the pigment degradation phenomena themselves using (X-ray) microbeam methods. This partner is specialised in the use of synchrotron radiation based methods of sensitive and species-specific analysis such as X-ray microfluorescence, X-ray absorption spectroscopy, X-ray diffraction and X-ray micro tomography. One of the important tasks of partner P2 (ULg) will be to focus on the collection and analysis of aerosol particles in and near musea. Its analytical expertise resides with the use of proton induced X-ray emission and with the use of portable Raman spectrometry. Partner P3 (KIK-IRPA) will contribute its expertise re. photographic documentation of works of art and re. spectral characterization of paint multi layer samples while also being engaged via its library of historic paint samples.

SSD SCIENCE FOR A SUSTAINABLE DEVELOPMENT

RISKS

S2-ART

Role and long-term evolution of metalsulfides in paintings

Based on the results obtained by the aerosol collection and analysis campaigns, identifying the type of pollutants that are present in museum atmospheres, Partner 1 can study the effect of these materials on paint surfaces via accelerated ageing. The degradation products will be characterized by all partners using the methods they have expertise in. The results of all these observations will allow Partner 2 to draw up recommendations regarding measures to improve museum atmospheric conditions and assess these in practise.

EXPECTED RESULTS

Results of the above investigations will include increased insights into the mechanisms of pigment degradation, into the types of chemicals that cause or catalyse these transformations and how air borne aerosol types may act as source of such chemicals. The role of cyclic changes in temperature and humidity in promoting transport of secondary chemicals to the surface of painted works of art will become elucidated Also will it be possible to assess the effectiveness of measures designed to modify the museum atmosphere. These observations are expected to result in scientific papers and conference communications and will also be the subjects of a dedicated workshop at the end of the project. The final result of the project will be a set of recommendations for improving museum atmospheric conditions..

PARTNERS

Activities

Next to coordination of the project, partner P1 will be responsible for accelerated ageing of paint model samples, of original degraded paint samples and their characterization using microbeam methods.

Partner P2 will be responsible for aerosol collection, analysis and characterization as well as the drawing up of recommendations for improved museum atmospheres.

Partne P3 will make available its library of historic paint samples and dedicated paint characterization and aging facilities.

All partners will be responsible for maintaining a dialogue with several musea in Belgium and neighbouring countries.

CONTACT INFORMATION

Coordinator

Prof. Dr. Koen JANSSENS
Antwerp X-ray imaging and instrumentation laboratory (AXiL)
Department of Chemistry
Universiteitsplein 1, B-2610 Antwerp
Tel: +32 3 265 33 22
Fax: +32 3 265 23 33
koen.janssens@ua.ac.be

Partners

Dr. David STRIVAY
Centre Européen d'Archéométrie (CEA)
Département de Physique,
Allée du 6 Août, 17, Sart Tilman B5a,
Tel: +32 4 366 36 95
email:strivay@ulg.ac.be

Dr. Jana SANYOVA
Koninklijk Instituut voor het Kunstpatrimonium - Institut Royal du Patrimoine Artistique,
Dpt. Laboratoires (KIK-IRPA)
Parc du Cinquantenaire, 1, B-1000 Bruxelles
Tel: +32 2 739 67 66
Fax: +32 2 732 01 05
jana.sanyova@kikirpa.be

Follow-up Committee
For the complete and most up-to-date composition of the Follow-up Committee, please consult our Federal Research Actions Database (FEDRA) by visiting http://www.belspo.be/fedra or

SSD SCIENCE FOR A SUSTAINABLE DEVELOPMENT

Belgian Science Policy
Louizalaan 231 Avenue Louise • B-1050 Brussels
Tél. +32 (0)2 238 34 11 • Fax +32 (0)2 230 59 12 • www.belspo.be/ssd
Contact. Christine Mathieu

RISKS