

# CATS



**Centre for Art Technological  
Studies and Conservation**



## **ANNUAL REPORT 2018**

# CATS

## Centre for Art Technological Studies and Conservation

The centre is a strategic research partnership between three Copenhagen based research institutions

- Statens Museum for Kunst (SMK)
- The National Museum of Denmark (NMD)
- The School of Conservation at the Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation (KADK)

The cornerstone of CATS is technical art history, which is an interdisciplinary field of research between conservators, natural scientists and scholars from art historical and cultural studies. Technical art history investigates the making and meaning of art works, painting techniques and artists' materials.

A main objective of the research centre is to develop new and more exact methods to diagnose, treat and preserve our art historical heritage. The exploration of artistic practices is aimed at shedding light on the complex and fascinating cartography of ageing processes within works of art – to contribute to and advance the field of technical art history.



The establishment of the Centre for Art Technological Studies and Conservation was made possible by a donation by the Villum Foundation and the Velux Foundation, and is a collaborate research venture between Statens Museum for Kunst, the National Museum of Denmark and the School of Conservation at the Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation.

VILLUM FONDEN  VELUX FONDEN

### Contact CATS

Website: [www.cats-cons.dk](http://www.cats-cons.dk)  
E-mail: [cats-cons@smk.dk](mailto:cats-cons@smk.dk)

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## Introduction

In May 2017 we celebrated the first six years of CATS' activities as a research centre with a reception at our premises. Representatives from The Velux Foundations, the foundation that made CATS possible, met with staff from the three institutions, SMK, NMD and KADK, for celebration.

On that occasion we handed out a small booklet describing our achievement over the six years including project results, publications and a list of the papers and other scientific contributions from the consortium. We found it quite an accomplishment to be able to present the following statistics for the first six years:

- CATS organised 4 *international conferences* under the themes *Technical Art History*.
- We published 3 *CATS Proceedings* (online & printed) and 1 preprint, all realized in collaboration with Archetype Publishers Ltd., London.
- We published 2 books in the *CATS Series of Technical Studies*, one on Bosch & Bruegel and one on the painting techniques of Nicolai Abildgaard and his contemporaries.
- Also 1 book on *Art & Plastics* focusing on user inclusion of artists, conservators and the plastics industry addressing conservation and innovation.
- 1 online resource *Wooden Supports in 12th–16th-Century European Paintings*; an annotated translation of a 1961 iconic book – funded by The Getty Foundation.
- In 2012 we organised an exhibition at SMK: *Gennemlyst. På sporet af Bosch & Bruegel*, established through user inclusion of 29 young volunteers from our *Unges Laboratorier for Kunst* (ULK).
- 3 Ph.D. projects were realised: one on the negative effects of wax-resin lining of Danish Golden Age paintings, another on the changing colour schemes of Danish church interiors over time, and finally one on seventeenth-century trading in artists' materials at the royal Danish court.

Researchers from the three CATS' partners have – often in collaboration with external partners – in the first six years contributed with

- New knowledge in 94 – primarily peer reviewed – articles, papers and posters.  
~ In average 15 publications annually.
- CATS staff presented 103 conference talks.
- CATS realised 31 workshop or studio talks.
- CATS was mentioned in the press (printed media, radio, TV) 116 times over the past six years.

This seventh annual report will present a status of our activities from May 2017 through December 2018, the first c. 19 months without financial support from The Velux Foundations.

Our ability to generate external funding became tested and we are pleased to conclude that raising international as well as national funds have so far been successful. We further complement this support by carrying out research for a variety of external clients such as museums, collections, and private customers.

The need for conservation science and art technological research, that serves treatment and authentication of materials and objects in the SMK collection, cannot only be based on CATS as a self-sustaining entity within SMK. An embedding of the laboratories into the organisation – as in comparable art museums – will be necessary in order to successfully continue research into painters' materials and techniques and conservation methodologies for the optimal understanding, preservation, handling and dissemination of the more than 700 years of art in the collection of SMK.

We hope you will enjoy the read,



Prof em Dr Jørgen Wadum

## Results 2018

### CATS Conference

The biannual CATS Technical Art History conference was held 21 and 22 June 2018, titled *Trading Paintings and Painters' Materials 1550-1800*.



The focus of the conference was on the emerging international markets and their implications for the artistic production in Early Modern Europe (1550-1800), in particular in relation to the trade in paintings and artists' materials.

Eighteen highly interesting papers including two key-note talks were presented for an international audience of 107 delegates representing 16 countries world-wide.

Currently a peer-review process is underway to prepare the papers for the fourth CATS Conference Proceeding to appear in late spring 2019 on Archetype Publications Ltd. in printed form and at the CATS website as an online resource.

The venue of the conference was the National Museum of Denmark with visits to the Royal Cast Collection at SMK and with a conference dinner at KADK in the harbour – a place where over centuries the trade of materials and objects took place.

The CATS conference took place under the patronages of the *European Year of Cultural Heritage 2018*.



### IPERION CH Annual Meeting in Copenhagen

On 18, 19 and 20 April 2018 the 3rd Annual IPERION CH Meeting was held in Copenhagen, with adjoined E-RHIS meeting. On behalf of CATS the meeting was hosted by the Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation (KADK). Representatives from all 24 IPERION CH partners met to discuss the state of advancement of the project and to analyse next actions and perspectives.

IPERION CH is a consortium of 24 partners that aims at establishing a unique European research infrastructure for restoration and conservation of Cultural Heritage.

It offers training and access to a wide range of high-level scientific instruments, methodologies, data and tools for advancing knowledge and innovation in the preservation of Cultural Heritage. IPERION CH is part of the E-RIHS ESFRI proposal.



**IPERION CH**  
Integrated Platform for the European  
Research Infrastructure ON Cultural  
Heritage

## Research

### Ongoing projects:

#### MoCMA (Mobility Creates Masters)

CATS has been awarded a grant within the framework of the Independent Research Fund Denmark's E2016 and F2017 call. The aim of this grant is to strengthen research areas that are geographically and institutionally scattered, and to support networks which could lead to larger projects or larger interdisciplinary groups of researchers working across institutions.

The aim of the research network MoCMA is to share knowledge, experience and results amongst the participating institutions while investigating materials, the background for, and the impact of the coloured ground layers in paintings across Europe from the Early Modern Period.



MoCMA is a ground-breaking international network that aims to strengthen the exchange of theoretical and object related research into paintings from the 16th and 17th centuries.

The following institutions are a part of MoCMA:

- Netherlands: [University of Amsterdam](#), [Vrije Universiteit](#) and [Rijksmuseum, Amsterdam](#)
- Denmark: [University of Copenhagen/Aarhus University](#) and [Statens Museum for Kunst, Copenhagen](#)
- Sweden: [University of Stockholm](#) and [Nationalmuseum, Stockholm](#)
- Spain: [Museo del Prado, Madrid](#)
- UK: [National Gallery, London](#)

*Research period 2017 → 2019*

#### Dendro4Art

Based on Professor Emeritus Dr Peter Klein's (University of Hamburg) dendro-chronology database (tree-ring stratigraphy), studying the chronology of artworks and sculptures to supplement the art history of these objects, Dendro4Art will create a digital archive of dendrochronology in art across Northern Europe and the Baltic region.

The project includes the assembling of three data sets (meta data, raw data and historic analogue documentation), a data management storing plan with the aim to allow access to the tree-ring data so that new data can be compared with the old. The CATS Dendro4Art database will be accessible for public and scholars as well as a special login for researchers for updating the database.

This project has been made possible thanks to a generous grant from The Carlsberg Foundation.



*Research period 2016 → 2019*

### Light Matters – Photographic Material Related to Vilhelm Hammershøi and his Circle

The goal of this project is to instigate novel technical and art historical research on important collections of Danish photography by and connected to the artists Vilhelm Hammershøi and Valdemar Schønheyder Møller and to their paintings. The study will identify the photographic material used by Hammershøi and his circle and supply knowledge about these objects within Danish cultural heritage around 1900 and thereby offer an important new relationship to comparable collections abroad. This research project takes its starting point in the collections of Statens Museum for Kunst (SMK) and Den Hirschsprungske Samling (DHS) both containing numerous works by Vilhelm Hammershøi and the latter also relevant archive material connected to the artist. The works by Valdemar Schønheyder Møller are sparsely presented at Danish museums - on the other hand there is an important collection of photographs by him at DHS and not least at The Royal Library in Copenhagen (RL) in the archives with photographic material connected to the Hammershøi family.



*Research period 2017 → 2019*

### MARKS ON ART

A wide diversity of marks is found on paintings on panel and copper supports, carved altarpieces, sculpture (wood and stone), and furniture. They comprise guild brands, quality stamps, copper and panel makers' marks, master's marks, so-called 'Hausmarken' (house marks), as well as positioning marks. These marks offer unique information about objects and their manufacture, transport, dating, places of production, artists, provenance etc., which is of fundamental importance for our knowledge and understanding of artworks and their production. A database of all these marks will open up unprecedented research possibilities.

Data entering has begun based on the more than 1.000 marks on panels and paintings on copper documented by J. Wadum since the nineteen-eighties.

<https://rkd.nl/en/projects-publications/projects/124-marks-on-art-database>

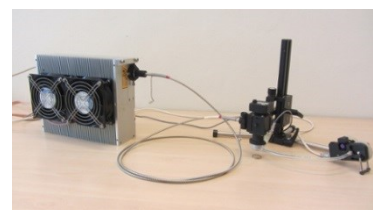


*Research period 2017 → 2022*

### Multi-isotopic analysis of early modern art. Linking origin, trade and production of raw materials with provenance research (MITEEMA).

Is it possible to objectively determine where and when works of art were produced? It might be, by establishing a geochronology of the metals used in the manufacturing process of these objects. This multidisciplinary project will combine geochemical analysis with the production and trade history and verify the data by studying a reference collection of objects with well-known provenance and different age. The project takes place with NICAS and is led by Prof Dr G.R. Davies (VU Amsterdam).

<http://www.nicas-research.nl/full-projects/miteema/miteema.html>



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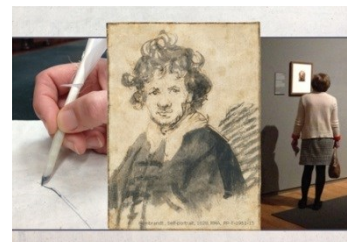
*Research period 2017 → 2020*

### **Drawing out Rembrandt. A model for reconstructing the past, analysing the present and predicting the future condition of Rembrandt's ink drawings.**

Rembrandt's ink drawings on paper constitute a core part of the oeuvre of this continuously experimenting artist. Until recently the material characteristics of drawings could not be studied in depth as a result of the limited suitability of available analytical techniques. Due to recent technical advances new opportunities arise. For the first time, Rembrandt's drawings from some of the world's most important collections are the focus of an integrated trans-disciplinary research.

The project takes place with NICAS and is led by Dr E. Hinterding (Rijksmuseum Amsterdam).

<http://www.nicas-research.nl/collaborative-projects/drawing-out-rembrandt.html>



**NETHERLANDS INSTITUTE FOR CONSERVATION + ART + SCIENCE +**

*Research period 2017 → 2020*

### **On the trail of Danish Golden Age Colours**

*Troels Filtenborg, Senior Researcher at SMK-CATS*

The research project *On the trail of Danish Golden Age Colours* is supported by a grant from the research programme of the Danish Agency for Culture and Palaces. The objective of the project is an investigation of colours used by Danish painters in the period c. 1810-1850 with a focus on identifying age-conditioned optical changes in their paintings such as darkening, fading, increased or reduced translucency etc. Primary written data sources are artists' letters, diaries, account books, estate auction catalogues and newspaper advertisements of the period. In addition to the archival and analytical study, the aim is to examine how degradation may have caused changes in tonality, contrasts and differentiation of the paintings' motifs, and thereby affected the way we view and perceive the compositions. In this context, the ambition is also to visualize what the paintings looked like in their original state.



*Research period 2018 → 2019*

### **The digitization of cross-sections from Italian and Dutch paintings**

The American Friends of Statens Museum for Kunst – in short AF SMK – has been granted a substantial donation by the Samuel H. Kress Foundation which will be used for the SMK-CATS project: *The digitization of cross-sections from Italian and Dutch paintings.*

Within this project we will be able to digitize cross-sections taken in the past from 54 Italian and from 88 Dutch paintings in high-res quality for an open access in the *Art and Technology Research Database* on ground layers in European paintings from the 16th and 17th centuries.

This is part of our IPERION-CH collaboration with the National Gallery (London), The Prado and the Doerner Institute (Munich). As SMK is very committed to the notion Sharing is Caring we are extremely grateful to the Samuel H. Kress Foundation for supporting us in making scientific data on old master paintings available to the field.



**KRESS**

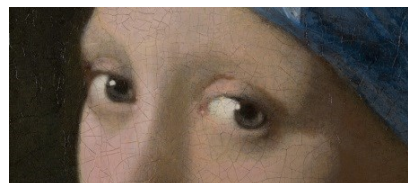
*Research period 2018 → 2020*

### ***Girl in the Spotlight, advanced analysis of Johannes Vermeer's Girl with the Pearl Earring, The Hague.***

Jørgen Wadum, Abbie Vandivere, Annelies van Loon, Robert Erdmann, Sabrina Meloni, Klaas Jan van den Berg, Edwin Buijsen, Carol Pottasch, Joris Dik, B van Wingerden, John Delaney, Emilien Leonhardt, Robert van Langh, Koen Janssens, Emilie Gordenker, Tom Callewaert, Rene Gerritsen, Willemijn Elkhuizen, Mathijs van Hengstum, Alessa Gambardella, Victor Gonzalez, Kate Dooley, et al.

From Monday 26 February to Sunday 11 March 2018 an in-depth scientific examination of the Girl with a Pearl Earring (c. 1665) by Johannes Vermeer will take place: 'The Girl in the Spotlight'. The museum's most famous painting was last examined in 1994, during a conservation treatment.

Although further restoration is not yet required, major advances in non-invasive technical analysis have been made over the last 25 years. The Mauritshuis hopes to learn more about how Vermeer painted the Girl with a Pearl Earring, as well as the materials that he used. The research will take two weeks and will be conducted in public at the Mauritshuis.



*Research period 2018 → 2020*

### **Restaurierung des Gemäldes „Brieflesendes Mädchen am offenen Fenster“ von Johannes Vermeer, Gal.-Nr. 1336, Dresden.**

Jorgen Wadum, David Buti, Elke Oberthaler (KHM, Vienna), Ige Verslype (Rijksmuseum), Ursula Haller (HfBK, Dresden), Christoph Herm (HfBK, Dresden), Uta Neidhardt (SKD, Dresden), Christoph Schösel (SKD, Dresden), Marlies Giebe (SKD, Dresden), et al.

After the successful restoration of Vermeer's early work "The Procuress" in 2002–2004 by Prof Marlies Giebe, art historians and conservators became increasingly interested in the second world-famous and revered painting by Vermeer that is held in Dresden, "Girl Reading a Letter at an Open Window". The earliest conservation research as well as art historical and technical examinations undertaken on the Dresden painting took place in the 1970s, when the work first became a subject of extensive art-historical analysis.



*Research period 2018 → 2020*

### **The Painting Technique of Jens Juel – Theory and Practice in the Light of 18th Century Fine Arts Tradition. A PhD project by Tine Slotsgaard (KADK-SMK)**

Jens Juel (1745-1802) is considered one of the most important portrait painters in Denmark. Although he has been the subject of several art historical studies, still little knowledge exists about his painting technique.

The division between artist and artisans was still at an early stage. The Royal Danish Art Academy, founded in 1754, only taught art theory and drawing while the act of painting itself took place in the private studios.

The studios were independent and their methods and recipes communicated from master to apprentice through oral transfers. With scientific investigation of paintings by Jens Juel paralleled with contemporary written sources and publications, this project aims to light



upon and obtain a larger understanding of how a Danish artist worked in the second half of the 18th century, what materials were used and the studio practice. This will also give a greater insight into the social position of the academic artist, on the distribution of theoretical and practical knowledge across European borders, and the rise of a market for artistic materials and practice in Denmark. The results of this project will also contribute to an improved preservation strategy and possibly in concerns about authenticity.

<https://adk.elsevierpure.com/en/projects/the-painting-technique-of-jens-juel-theory-and-practice-in-the-li>

*Research period 2017 → 2020*

### The Ledreborg Project

The project 'Netherlandish Paintings in Ledreborg Palace: A Multi-Disciplinary Research of circa 600 Paintings' (NePLeP) will result in open-access records of hitherto undocumented and unstudied paintings. Simultaneously the latest expertise in socio economic art history and technical study of paintings shall be implemented in an attempt to explain the unusually high availability of Netherlandish 17th century paintings in Danish collections. The project will provide the young professional researcher with essential training to become an expert in the application of technical tools and instruments in the socio-economical study of Netherlandish paintings.



*Research period 2017 → 2019*

### Examination of Abildgaard's architecture and architectural decorations

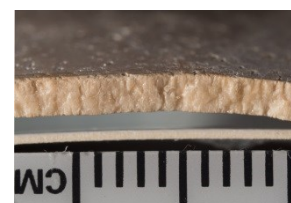
A comprehensive survey of the interiors designed by Abildgaard has been completed, with a registration of all accessible information, written sources, drawn material, photographic documentation, etc. Paint layers in relevant cases have been sampled and analysed for their content of pigments and binding media. The project was carried out in collaboration with the analytical units at NMD and SMK. Collaboration has further been initiated between Line Bregnhøj and architectural historian Hanne Raabymagle. Presentations have been made and publication of a conference paper and book are in progress.



*Research period 2016 →*

### Did the 4000 years old red eggs in Bahrain have importance for ancient decorating techniques in Denmark?

Examination of 4000-year-old coloured and patterned ostrich eggs from Bahrain, and seek to restore the original manufacturing technique by means of reconstructions of the decoration techniques. With new knowledge of manufacturing techniques and decorations from the Mesopotamian and Persian cultural area, we will be able to understand whether these techniques have influenced decorating techniques in Northern and Western Europe - and thus also in what is currently Denmark. The team consist of Mikkel Scharff, Jane Richter (KADK-CATS) and Gianluca Pastorelli (SMK-CATS). <https://kadk.dk/case/de-roede-aeg-fra-bahrain>



*Research period 2018 →*

### The characterisation the proteinaceous residues from the ground layer of a series of easel paintings, dating back to the Danish Golden Age.

Samples have been collected from the tacking edges of five 19th-century artworks by Christen Købke and C.W. Eckersberg at SMK and the Royal Danish Academy of Fine Arts. The identification of the biological source of the material, as well as a partial characterisation of the damage of the proteins, have been achieved. The project is a collaboration between the above institutions and the University of Copenhagen.

TEMPERA ETN is a Marie Skłodowska Curie European Training Network (ETN) providing interdisciplinary training in palaeoproteomic analysis of cultural heritage.



*Research period 2018 →*

## Research projects completed in 2018:

### After the Black Death: Painting and Polychrome Sculpture in Norway, 1350–1550 (ABD)

The project *After the Black Death: Painting and Polychrome Sculpture in Norway, 1350-1550 (ABD)*, supported by the Research Council of Norway. CATS and University of Oslo researchers are working together on publications and they have submitted two conference abstracts “Gilding strategies in late-medieval objects from Norwegian churches: Analysis, characterization and relationships” to ICOM-CC Conference and “A spectroscopic study of metal foils and its layering in Norwegian Medieval objects” to TechnArt 2017 Conference.

The project is now officially complete even though certain activities will continue into 2019. The exhibition *Transformation / Forvandling* will open at Kulturhistorisk Museum, Oslo, at the end of January 2019.



Detail of the Skjervøy altarpiece, (Photo: Kulturhistoriske Museum, Universitetet i Oslo, Ove Holst)

Research period 2015 → 2018

UiO : Universitetet i Oslo

### The Mystery of Christian II's painting

In 1514 Michel Sittow painted a portrait of the Danish king Christian II. The painting became one of the most iconic pictures of the king who went down in history as one of Denmark's most notorious rulers. In 2018, the Art Museum of Estonia in Tallinn opened, in collaboration with The National Gallery of Art, Washington, a major exhibition of paintings by the Estonian artist Michel Sittow. In this connection the painting was examined and restored, the results of which we have captured in a film that takes a closer look at Sittow's royal portrait of Christian II.

<https://www.youtube.com/watch?v=89iPSO0e1cM>

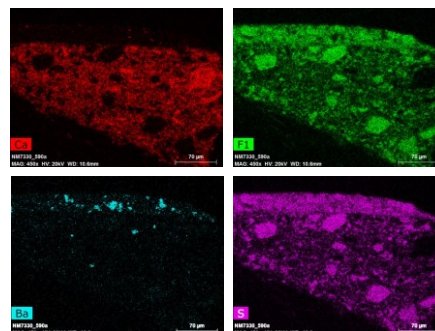
Hanne Kolind Poulsen & Troels Filtenborg presented their paper, *Michel Sittow's Portrait of Christian II of Denmark: Its Genesis and History. Technical research at the international conference Michel Sittow, Estonian Painter at the Courts of Renaissance Europe*, held in Tallinn, Estonia, in September 2018.



Research period 2016 → 2018

### Danish Golden Age research with the Nationalmuseum, Stockholm

In preparation for the exhibition *The Danish Golden Age Razor sharp in details, realistic, dreamy. Painting at its best* (Feb 28–July 21, 2019) a team of researchers from CATS-SMK, commissioned by the National Museum of Stockholm, studied six paintings belonging to the Danish Golden Age collection. The request was to investigate the materials and technique employed by Christoffer Wilhelm Eckersberg, Christen Købke and Martinus Rørbye in selected paintings from the Nationalmuseum in Stockholm by means of X-ray fluorescence (XRF), fibre optics reflectance spectroscopy (FORS) and Fourier Transform Infrared Spectroscopy (FTIR). In order to have information on the layers build-up, samples were collected on five of the six paintings, embedded in resin to prepare cross-sections and investigated by optical microscopy and scanning electron microscopy with energy dispersive X-Ray spectroscopy (SEM-EDXS). The technical data and their interpretation will be shown in the forthcoming exhibition.



Research period 2018

**CATS was an associated partner in a EU Joint Project Initiative (JPI-JHEP):**

**Cleaning Modern Oil Paintings (CMOP)**, established and initiated under the leadership of J. Wadum in his capacity of professor at the University of Amsterdam, is a collaborative European research project exploring some of the most interesting and pertinent challenges associated with the conservation of 20th and 21st century oil paintings with a special emphasis on cleaning issues. The project was led by Prof Dr Klaas Jan van den Berg, University of Amsterdam & Senior Conservation Scientist, Cultural Heritage Agency, The Netherlands. CMOP aims to understand oil paints as they present a range of conservation challenges distinct from those found in paintings from previous centuries like vulnerable surface 'skins', efflorescence, unpredictable water and solvent sensitivity, and alarming incidences of dripping paints several years after the paintings have been completed. Many of these paintings are also unvarnished rendering their surfaces particularly vulnerable. Cecil Krarup Andersen undertook research into the mechanical properties of modern oil paints in collaboration with Martin N. Mortensen from the National Museum of Denmark and Ashley Freeman, Vincent Beltran, Michał Łukomski, and Alan Phenix from the Getty Conservation Institute. The proceedings from the final conference are currently in the process of being published by Springer. Mikkel Scharff is co-editing this publication.



<https://www.tate.org.uk/about-us/projects/cleaning-modern-oil-paints-0>

Research period 2016 → 2018

**Identifying Lead Compounds - Lead white mock-up experiments/Dark Future?**

Nora Schlag, an Erasmus Student from the Hochschule für Bildende Künste, Dresden, during a five months period produced mock-ups containing lead white pigments closely manufactured to the original technology (16th and 17th Century) in 3 different binding mediums. She subjected the samples to 2 different ageing tests which were carried out at the KADK-CATS laboratories. Significant colour changes were observed relating to differences in binding medium, concentration and in air pollutants. The project is part of a larger international research into the identification of darkening lead white pigments in old master drawings.



Research period 2018

**Picasso's Acrobat Family with Monkey in focus: an investigation of materials and techniques of an iconic work in the collection of the Gothenburg Museum of Art**

On request from, and in collaboration with, the Gothenburg Konstmuseum SMK-CATS carried out extensive non-invasive analysis (FORS, FTIR, XRF, and multispectral imaging) of Picasso's early work the *Acrobat Family* (1905) were carried out. The results informed us about the painting technique and materials employed, something that explained some visual alterations due to combined by inherent as well as external factors.



<https://www.youtube.com/watch?v=xUtXav-p2TY&index=11&list=PLoYR5PX6uX0a4YKLOupEcBV-EiHW-TC62>

Research period 2018

## New conservation-restoration related research projects in 2018

### Evaluation of cleaning techniques on plastic artefacts.

Yvonne Shashoua (Nationalmuseet), Margherita Alterini (Erasmus student, Bologna, Italy), Gianluca Pastorelli (SMK-CATS), Louise Cone (SMK-CATS).

Surveys of European, contemporary art collections suggest that more than 75% require cleaning. Two large EU research projects, POPART (2004-2008) and NANORESTART (2015-2018) in which the Danish National Museum was key partner, concluded that that by combining specific cleaning tools (cloths, brushes, gels etc.) and cleaning agents (water, detergents, solvents), removal of the most common soils from model plastics while minimizing damage to surfaces could be optimized. This investigation uses case histories to compare results from model plastics to artworks including those at SMK.

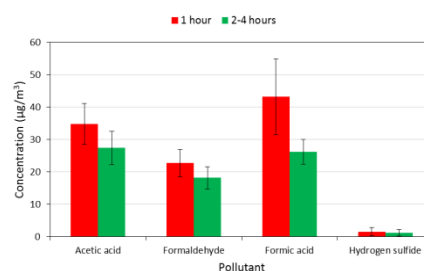


*Start October 2018 → April 2019*

### Air-quality and off-gassing analysis by SIFT

Gianluca Pastorelli, Niels Borring, Jens Glastrup (MSC).

Average concentrations of pollutants in storage areas and in cardboard boxes for old master drawings were measured and calculated in order to refine preventive conservation strategies. The project is closely related to the two projects on remounting all drawings and prints and the Identification of Lead Compounds in Highlights on Old Master Drawings.



*Start December 2018 → 2019*

### Internal requests for research during 2018:

Numerous internal requests for analysis by SMK-CATS were made by the Conservation Department as well as from the Curatorial Department. Some of the issues related to:

- questions of bronze disease;
- analysis of whitish deposits on the inside of the glass protecting an oil painting on paper glued to a Masonite panel;
- discolouration of green paint;
- analysis for the Neapolitan project (Troppa, Rosa, etc.);
- analysis for the Flip-Sides exhibition;
- analysis on El Greco;

Apart from this also research for a number of external clients were carried out, primarily solving questions of authenticity of a range of art works having too ambitious attributions.

David Buti, Gianluca Pastorelli, Sofie Wikkelsø Jensen, Astrid Grindler-Hansen, Jørgen Wadum

## New *international* research collaborations initiated in 2018:

### **The investigation of the Painting Technique of Sir Isaac Oliver**

David Buti, Paola Ricciardi (Fitzwilliam Museum), Christine Slottved Kimbriel (Hamilton Kerr Institute).

The project is a pilot study on a small selection of Fitzwilliam Museum miniatures attributed to the renowned miniaturist Isaac Oliver. It is an extension of a currently ongoing technical study and conservation treatment at the Hamilton Kerr Institute, the painting conservation department of the Fitzwilliam Museum, of the cabinet miniature of Lord Herbert of Cherbury, which was recently bought by the National Trust for the exhibition at Powis Castle in Wales.



<https://www.npg.org.uk/whatson/elizabethan-treasures/exhibition/>

Start 2018 →

### **The father, the son, the followers: Six Brueg(h)els in Copenhagen examined**

Anne Haack Christensen, Jørgen Wadum, David Buti, Loa Ludvigsen, Eva de la Fuente Pedersen, Arie Pappot (Rijksmuseum).

SMK holds a hitherto unexplored group of paintings, some signed by or attributed to Pieter Bruegel the Elder and Pieter Brueghel the Younger, others as School of Brueg(h)el. These paintings have not previously been the subject of technical analyses nor have they been contextualized within existing research on the painting techniques of the Bruegel family. A fresh look at these paintings including advanced analytical techniques has revealed much new evidence for (re-)attributions.



Start 2018 → 2019

## Conference presentations:

### **The Bruegel Success Story: Symposium XXI for the Study of Underdrawing and Technology in Painting**

The first results of our international project *The Father, the Son, the Followers: Six Brueg(h)els in Copenhagen Examined* was presented in Brussels and stirred much debate and dialogue. Further we presented a second paper *on An Enigmatic Panel Maker from Antwerp and His Supply to the Brueghels*, addressing the chronology of Guiliam Aertssen's panels.

The papers from this international conference, held in the Royal Museums of Fine Arts of Belgium, will be published in 2019.



### **The 12th European Society for Literature, Science and the Arts Conference in Copenhagen 13-16 June 2018 focuses on the topic of GREEN.**

The CATS talk: *Paintings from Schrieck to Weie: perceiving greens or red, yellow and blue* addressed the notion that landscape painting would not exist without an exorbitant use of a large variety of greens. Will our eye compensate for the flaws in the green hues when viewing a 400 years old aged painting?

In twentieth century art some greens may stay hardly unaltered against other modern pigments of red, yellow and blue which may fade partly or completely. How do we then perceive deliberately colourful modernistic scenery?

The paper will in 2019 appear in *Perspective*, a peer-reviewed on-line journal dedicated to research that is of relevance to Danish art.



### **Wax-resin linings and Relative Humidity -Case studies and lab tests**

12 October 2018 Cecil Krarup Andersen took part in the ICON conference "Wet Paint" in Edinburgh. She and Christine Slottved Kimbriel, Hamilton Kerr Institute, Cambridge University presented joined research into the reasons why some paintings that are treated with wax-resin show distortions as a result of being moved from one location to another. This will be published in an Archetype publication. Cecil further gave a presentation at Hamilton Kerr Institute, Cambridge University 11 October 2018, where she talked about the challenges of canvas paintings conservation when intervening with the structure of a painting.

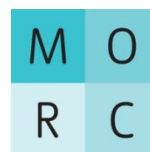


### **Talk at Modern Oils Research Consortium (MORC) meeting**

On 5 February 2019 Cecil Krarup Andersen was invited to present research results within CMOP for the MORC consortium and discuss possibilities for further collaborations. These results included some mechanical properties of oil paints and how relative humidity is affecting some modern oil paints.

The network is described here:

<https://www.tate.org.uk/about-us/projects/modern-oils-research-consortium>



Modern Oils  
Research Consortium

## HNA Conference Ghent 2018, Ghent University, Ghent, Belgium

During the HNA conference *Session XVIII: on 17th-Century Dutch Art* was co-organised by Angela Jager, CATS/University of Amsterdam and Alison Kettering, Carleton College. Further Jager gave PECHA KUCHA presentation 'Quantity over Quality? Netherlandish Paintings in a Danish Private Collection'.

At the same conference Jørgen Wadum in the *Workshop XI: Visualizing Netherlandish Art in the Digital Era*, presented the

MARKS ON ART database in establishment at the RKD, The Hague, in collaboration with a number of stakeholders among which is CATS. The second digital resource presented was the Dendro4Art database initiated by CATS but also to be hosted by the RKD.

HNA CONFERENCE  
GHENT 2018, 23 – 26 May



## Around Picasso: An insight into the relationship between material choices and failure mechanisms.

A symposium held at the Museu Picasso, Barcelona, 29 November 2018. The Conference was part of the research project ProMeSa on the studies of the mechanical properties of modern oil paintings with a special focus on Picasso in which KADK takes part. The project is led by professor Laura Fuster-López from the Polytechnical University of Valencia. Cecil Krarup Andersen and former CATS scientist Anna Vila were in the scientific committee for the conference. The results of

extensive non-invasive analysis of Picasso's Acrobat Family in the Gothenburg Museum of Art was presented by Mariateresa Pullano (Gothenborg) and David Buti at the symposium as

Case Study 7: 'Picasso's Acrobat Family (1905) in focus: an investigation of materials and techniques of an iconic work in the collection of the Gothenburg Museum of Art'. The paper will be published in the proceedings to appear in 2019. The presentation can be viewed via this link:

<https://www.youtube.com/watch?v=xUtXav-p2TY&index=11&list=PLoYR5PX6uX0a4YKLOupEcBV-EiHW-TC62>

The paper: "1917 Picasso Paintings": *the Role of Grounds in the Failure Mechanisms* was given by Cecil Krarup Andersen and Anna Vila. They presented results related to the investigations into degradation causes of four Picasso paintings from Museo Picasso. The co-authors are A.Murray, F.C.Izzo, L. Fuster, E. Aguado, R. Jiménez and Annemette Scharff. The presentation can be viewed via this link:

<https://www.youtube.com/watch?v=sURZ8jwFvU&list=PLoYR5PX6uX0a4YKLOupEcBV-EiHW-TC62&index=5>

# Around Picasso

## Symposium Rembrandt Conservation Histories: International symposium on the history of conservation of paintings by the Dutch 17th-century master, Rembrandt van Rijn

This two day symposium 8→ 9 November 2018 was organised on the occasion of the research and treatment of the portraits of *Marten Soolmans* and *Oopjen Coppit* by Rembrandt van Rijn, jointly acquired by the Rijksmuseum in Amsterdam and the Musée du Louvre in Paris. It will be the first in a series of conferences on the history of conservation. In the future, similar conferences will be organised on the treatment history of paintings by Frans Hals, Johannes Vermeer and Jan Steen. Jørgen Wadum was invited to give the final keynote lecture titled *From ten to zero and now two - the Rembrandt's at SMK uncovered*.



## ChemCH2018 – 5th International Congress “Chemistry for Cultural Heritage” in Bucharest, 3-7 July 2018

CATS talk: *Probing the fading of Prussian blue - Danish Golden Age oil paintings under investigation: linking the macro non-*

*invasive approach and the micro SR-based analysis is another*

The research into the fading of the Prussian blue is an ongoing project at CATS since 2013.

The opportunity of accessing the European Synchrotron Radiation Facility (ESRF) in Grenoble in summer 2017 allowed us to add further knowledge to this issue that has been puzzling researchers

in the last years. The results will be published in the near future in renowned scientific journals.



## Gordon Research Conference – Scientific Methods in Cultural Heritage Research. Leading Edge Applications of Data Science, Degradation Science, and Conservation Strategies for Cultural Heritage, Catselldefels, Barcellona, 22-27 July 2018

CATS poster: *Probing the fading of Prussian blue: from the macro non-invasive approach to the micro SR-based analysis*

The research into the fading of the Prussian blue is an ongoing project at CATS since 2013. The opportunity of accessing the European Synchrotron Radiation Facility (ESRF) in Grenoble in summer 2017 allowed us to add further knowledge to this issue that has been puzzling researchers in the last years. The results will be published in the near future in renowned scientific journals.



## Investigations into the mechanical properties of commercial artists' oil paint by Dynamic Mechanical Analysis (DMA), Nanoindentation (UNHT), and Dynamic Vapour Sorption (DVS)

24 May 2018 Cecil Krarup Andersen Gave a talk on the final CMOP conference where she presented results from the collaboration with National Museum of Denmark and the Getty Conservation Institute. The investigations included the use of nano-indentation on oil paint samples as well as a study of the glass transition temperature and sorption characteristics of these oil paints. This talk was later given again at Tate Gallery, London for a conservation study day 3 July 2018.



## Workshops, talks and lectures:

### Ekspert talk: Skjulte forvandlinger.

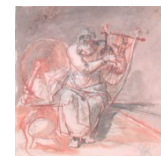
SMKFriday, 9. februar, 2018

Gennem tiden er der blevet tilføjet, fjernet og justeret i guldaldermalerier af Christen Købke. Lyt med når Jørgen Wadum, centerleder for CATS på SMK, undersøger værkerne.



### Art Fraud Seminar

The 22 February 2018 CATS organised the annual *Art Fraud Seminar* for students in forensic accounting from the University of Derby (UK) and Niels Brock Business College (Copenhagen). The international students are confronted with problems of attribution, scientific examination and issues of ethics in the analysis of art works.



### CATS Partner Meeting

On 3 May 2018 a gathering of the researchers with the CATS Partners met at the Nationalmuseum in Brede. The meeting is an informal forum for knowledge exchange and the presentation of new research ideas and project development. The nine presentations ranged from 17<sup>th</sup> century artists use of preparation materials on canvases through the identification of darkening lead compounds in highlights in old master drawings to cleaning of modern oil paints and sustainable coatings for plastics.



### The Second MoCMA Seminar

On 14 and 15 May 2018, the second MoCMA (Mobility Creates Masters) seminar was held by CATS in cooperation with the University of Amsterdam and the Rijksmuseum in Amsterdam, The Netherlands. More than thirty participants (partners and associated partners) gathered for lectures and discussions with the collective theme ***Science and Art History: Provenance of the materials in grounds and its visual impact on perception.***

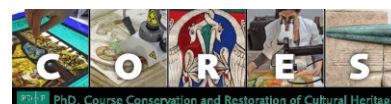


The aim of this second seminar was to bring the different partner institutions closer and together create and share knowledge, experience and results, focusing on the coloured ground layers in paintings across Europe from the Early Modern Period.



### The Faculty of Sciences and Technology (FCT NOVA)

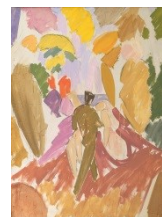
As an external advisor to the *Ph.D. Doctoral Programme in the Conservation and Restoration of Cultural Heritage* at the Universidade NOVA de Lisboa, Jørgen Wadum after the advisory meeting presented the talk *The Centre for Art Technological Studies & Conservation: Establishment - Achievements - Current Projects.*



### **Ekspert talk: Farven, der blev væk**

**SMKFriday, 4. april, 2018**

Tiden sætter sine spor - også på kunstværker. Lyt med, når Jørgen Wadum, centerleder for CATS på SMK, undersøger alderens indflydelse på Edward Weies hovedværk *Faun og Nymfe*.



### **Visit of the DB of AFSMK**

19 June SMK was the host for the Directory Board meeting of the American friends of SMK (AFSMK). The DB had a tour of the museum's exhibitions led by curators Henrik Holm and Dorthe Aagesen, followed by a special behind-the-scenes tour to CATS including a view of some of the drawing damaged by the darkening of the lead white highlights. Finally our guests paid a visit to the premises of Vilhelm Hammershøi at Christianshavn under the guidance of SMK curator Annette Rosenvold Hvidt.



### **The Visual Arts – Inorganic Stuff fixed by Organic Components**

Invited talk: An introduction to the nature of Technical Art History and heritage science as practiced in fine art museums, its challenges and questions is given – including an invitation to advance proteinaceous research in the fine arts field. Given at the opening of the Ancient Proteins@20 workshop (20<sup>th</sup> August 2018) sponsored by the Danish National Research Foundation, The National Science Foundation, the TEMPERA EU Training Network and the Max Planck Society.



### **Hvordan spotter man en ægte Rembrandt? - en introduktion til Rembrandts maleteknik og atelierpraksis**

Foredrag på J.F. Willumsens Museum i Frederikssund i forbindelse med udstillingen EKKORUM. Her var der mulighed for at komme i dybden med den aktuelle udstilling den 26. august fra kl. 11.00. Willumsen var ikke bleg for at tilskrive værkerne i hans private samling til datidens allerstørste kunstnere. Flere af værkerne er tilskrevet f.eks. Rembrandt, men er der egentlig noget om snakken?



### **KUNST PÅ BORDET**

Foredrag på Nivaagaards Malerisamling, 23. oktober, 2018.

Fra træstamme til maleritavle til delikat måltidsstykke, hvor de malede objekter og materialer fanger og reflekterer lyset så præcist som muligt. Sådan betager flamlænderen Pieter Claesz sit publikum i 1600-tallet i det nordlige Holland – og nu på Malerisamlingen med det nyerhvervede værk.



**CATS on November 11 hosted an extraordinary double lecture by Prof C. Richard Johnson, Jr., the Jacobs Fellow in Computational Arts and Humanities in the Jacobs Technion-Cornell Institute at Cornell Tech, New York.**

The first talk was on *Vermeer's Canvases: Computed Weave Map Matching for Rollmate Discovery* and described insights regarding attribution, dating, and artist's intent gained from computing the oscillation count of periodic signals of the thread count to all of the canvases of Vermeer's extant paintings. In the second talk, *Rembrandt's European Papers: Computer-Assisted Classification of Watermarks and Chainline Patterns for Moldmate Identification*, Rick applied binary decision tree technology and computer-based image processing to the moldmate identification process thereby demonstrating that the time needed for identifying water marks in paper can be reduced to a few minutes while also increasing the non-expert's confidence in the result.



**Christen Købkes maleteknik og farver: fra skitse til færdigt billede**

Foredrag hos AOF Herlev, 23. november 2018.

The talk will introduce the drawing techniques of Købke and how preparatory drawings and oil sketches were used for deciding on the final composition of a painting. In the second half of the talk issues of impermanency of some of the artist's pigments have changed our interpretation.



**Exhibition: Flip Sides (September 8, 2018 – March 10, 2019)**

Exhibition at SMK on the backsides of art works.

In this exhibition SMK is presenting the backside of artworks. In collaboration with CATS a wide selection of interesting backsides of art works have been selected to show the many varied stories and secrets that normally are hidden away towards the museum walls.



**Exhibition: Troppa's '4 portraits of ancient philosophers', Homer, Virgil, Saint John the Baptist and Saint Peter Penitent (gallery room 211F), have undergone**

conservation-restoration and are now presented together with other paintings by Troppa. With his four figures, full of pathos, Troppa has visualised the Platonic concepts of prophetic and poetic inspiration. An article in *Perspective* discusses this but also Troppa as a colourist and as a virtuoso painter. In the gallery presentation technical aspects of Troppa's choice of a black pigment - that surprisingly appears blue - is explained (in text and through a film) in an interdisciplinary collaboration between art historians, conservators, and conservation scientists.



## CATS 2018 dissemination list

### Publications

#### Peer reviewed:

Buti, David o.a.. "Further insight into the Mesoamerican paint technology: unveiling the colour palette of pre-Columbian Codex Fejérváry-Mayer by means of non-invasive analysis". *Archaeometry*. 2018. (2018).

<https://doi.org/https://onlinelibrary.wiley.com/doi/full/10.1111/arcm.12341>, <https://doi.org/10.1111/arcm.12341>

Buti, David o.a.. *Probing the fading of Prussian blue: from the macro non-invasive approach to the micro SR-based analysis*. Poster session presented at Gordon Research Conference, Castelldefels - Barcelona, Spain, 2018.

Domenici, D. o.a.. "Changing Colours in a Changing World: The Technology of Codex Painting in Early Colonial Mexico". *Materia Americana. The 'body' of Spanish American images (16th to mid-19th centuries)*. Conaculta, The Getty Foundation. 2018.

Domenici, Davide o.a.. "Materials, Technological Practices, and Painting Traditions. Cultural and Historical Implications of non-Destructive Chemical Analyses of Pre-Hispanic Mesoamerican Codices". og Dupey García, Élodie Vázquez de Ágredos Pascual, Maria Luisa (redaktører). *Colors on the Skin*. Tucson: University of Arizona Press. 2018.

Filténborg, Troels Folke "Ud af det blå - På sporet af Guldalderens farver". Cat. *The Danish Golden Age Razor sharp in details, realistic, dreamy. Painting at its best*. Nationalmuseum Stockholm (Feb 28–July 21, 2019); *Dansk Guldalder – Verdenskunst mellem to katastrofer* (Aug 24–8 Dec, 2019); Petit Palais, Paris (2020). Copenhagen . 2018.

Grazia, Chiara o.a.. "Exploring the materiality of Mesoamerican manuscripts by non-invasive spectroscopic methods: Codex Laud, Bodley, Selden, Mendoza and Selden Roll at the Bodleian Library". *Mesoamerican Manuscripts: New scientific approaches and interpretations*. Brill. 2018.

Haack Christensen, Anne og Jørgen Wadum "Painting Human Flesh: Theory Compared to Jacob Jordaens' Practice". van Wyhe, Cordula (red.). *Rubens and the Human Body*. Turnhout: Brepols Publishers. (The Body in Art (BIA); Journal nr. 3). 2018, 103-128.

Jager, Angela. "The workshop of Jacob de Wet (Haarlem, 1610-1675)". *Oud - Holland*. 2018, 131(2). 67-108.  
<https://doi.org/10.1163/18750176-13102003>

Jager, Angela, et al., 'Natif d'Audenaerde? New insights into the origins of Adriaen Brouwer and his life in the Northern Netherlands', in: Katrien Lichtert (ed.), *Adriaen Brouwer: Master of Emotions*, exh.cat. Oudenaarde: MOU Oudenaarde 2018: pp. 37-49.

Odlyha, M. o.a.. "A portable tool for the evaluation of Microclimate conditions within Museum enclosures, Transit Frames and Transport Cases.". *Studies in Conservation*. 2018, 63(Issue Supl. 1). 407-410.  
<https://doi.org/10.1080/00393630.2018.1499841>

Streeton, N., Daly, A., Platania, E., Vila, A. & Buti, D., 2018, 'Long-lost relations?', in *Transformation: Faith and Sacred Objects in the Middle Ages*. Bjerregaard, P. (ed.). Trondheim: Museumsforlaget, 2018, pp. 30-43.

Vila, Anna o.a.. "A Spectroscopic study of Metal Leaves and Layering in a group of Medieval objects from Norwegian Churches". *Microchemical Journal*. 2018.

## Appendix 1

### SMK-CATS staff 2018

- Prof em Dr **Jørgen Wadum**  
BA in Art History, Paintings Conservator (Director of CATS)
- Dr **David Buti**  
Conservation Scientist
- Dr **Gianluca Pastorelli**  
Conservation Scientist
- Drs **Sanne Bouwmeester** (→ Aug 2018)  
Research Coordinator CATS
- **Troels Filtenborg**, Senior Researcher & Senior Conservator  
MSc in Conservation (early Italian & Spanish art)
- **Niels Borring**, Senior Conservator  
MSc in Conservation (Art on Paper)
- **Louise Cone**  
MSc in Conservation, Contemporary Art
- Dr **Anne Haack Christensen**  
Paintings Conservator (Netherlandish art)
- **Kim Brasen**  
Mag.art in Art History & Digital Documentation
- **Astrid Grinder-Hansen**  
Student KADK, Copenhagen
- **Sofie Wikkelsø Hansen**  
Student, Copenhagen
- **Nora Schlag**  
Erasmus Student, HfBK, Dresden
- Senior researchers from the Collection and Research Department (SAFO)

### NMD-CATS Staff 2018

- Dr **Peter Rasmussen**  
Head of Environmental Archaeology and Materials Science
- Dr **Yvonne Shashoua**  
Senior Researcher (FT-IR spectroscopy, polymers)
- **Line Bregnhøj**
- MSc in Conservation of buildings and interiors, paint layers and archaeological colour research.

### KADK-CATS Staff 2018

- Associate Prof **Mikkel Scharff**  
MSc in Conservation (Faculty head → June 2018)
- Associate Prof. Dr **Ingelise Nielsen**  
Head of Graphics Department & MSc in Conservation (research on paper technology & water-marks)
- Associate Prof Dr **Cecil K. Andersen**  
Paintings Conservator, lecturer paintings conservation

## Collaborative Partners

- **Austrian Academy of Sciences**
- **CDA, Cranach Digital Archive**, Stiftung Museum Kunstpalast, Düsseldorf and University of Applied Sciences, Cologne
- **CNR-ISTM of Perugia and University of Perugia**, Department of Chemistry (Prussian blue project and copper-based green pigments project, CHEMCH conference), Perugia
- **The Getty Foundation**, Los Angeles
- **IPERION-CH**, Integrated Platform for the European Research Infrastructure ON Cultural Heritage
- **Metropolia University of Applied Science**, Helsinki
- **Munch Museum**, Oslo
- **Netherlands Institute for Conservation, Art and Science, NICAS**, Amsterdam
- **Netherlands Institute for Art History, RKD**, The Hague
  - **The Rembrandt Database**
  - **Gerson Digital: Dutch and Flemish Painting of the Golden Age in European Perspective**
  - **Marks on Art**
  - **Dendro4Art**
- **Nederlandse Organisatie voor Wetenschappelijk Onderzoek, NWO**, The Hague
- **National Gallery**, London
- **Nationalmuseum**, Stockholm
- **Prado Museum**, Madrid
- **Technical University of Denmark, DTU**, Department of Photonics Engineering
- **Technical University of Denmark, DTU**, Department of Applied Mathematics and Computer Science
- **University of Amsterdam**, Department of Conservation & Restoration, Department of Technical Art History, Amsterdam
- **University of Antwerp**, Department of Chemistry
- **University of Barcelona**, Department of Analytical Chemistry, Barcelona
- **University of Barcelona**, CCIIT (Scientific and Technical Center), Barcelona
- **University of Copenhagen**, Department of Chemistry
- **University of Copenhagen**, Department of Scandinavian Research: Care and Conservation of Manuscripts
- **University of Copenhagen**, Department of Cross-Cultural and Regional Studies
- **University of Maastricht**, New Approaches in the Conservation of Contemporary Art (NACCA).
- **University of Oslo**, Oslo
- **University of Perugia**, Institute of Molecular Science and Technologies
- **Rijksmuseum**, Amsterdam
- **Vrije Universiteit**, Amsterdam, Faculty of Science, Earth Sciences

## CATS' Publisher

- **Archetype Publications Ltd.**, London, c/o International Academic Projects, 1 Birdcage Walk, London, SW1H 9JJ. Tel: Int +44 207 380 0800 Fax: Int +44 207 380 0500. info@archetype.co.uk