

# CONSERVATION N

## MULTIBAND IMAGING TECHNIQUES WITH SILICON-BASED SENSORS

### Approach

Thanks to the arise of digital imaging systems, the study of paintings and polychrome heritage objects through non-invasive methodologies has been in constant growth in. Of great interest are, specifically, the imaging techniques comprised at various points of the electromagnetic spectrum, commonly known as multiband technical imaging (MBTI / MBI), —even if other terminologies, such as *multispectral imaging* or *technical photography* are also used to refer to same type of band images—. Nowadays, MBTI is a widely used non-invasive method for heritage examination. Although each technique considered within MBTI stands on its own, the combination of the different techniques provides a more in-depth view of the object by comparing the singular but complementary information obtained. A cross-sectional reading of these images tends to provide a better understanding of the process of execution of the object, including manufacture and material information which often allow a greater understanding of aspects of conservation. This is due to the specific behavior of some cultural materials in the visible, ultraviolet, and infrared wavelengths.

Although there is no universal consensus on the techniques that comprise MBTI, different images obtained with diverse sensors are often considered, including photographic techniques, IR reflectography, and X-ray radiography. In this volume, imaging techniques carried out using exclusively modified consumer digital cameras with silicon-based sensors (CCD and CMOS), are considered. Therefore, the main imaging techniques which can be applied to the study and documentation of polychrome heritage objects in different bands using silicon based sensors are essentially: reflected ultraviolet (UVR); ultraviolet induced luminescence (UVL or UVF); visible (VIS); transillumination (TL); reflected infrared (IR); transmitted infrared, also known as transirradiation (IRT); visible induced infrared luminescence (VIL); visible induced visible luminescence (VIVL); as well as false color imaging in the infrared (IRFC) and ultraviolet (UVFC).

While reflected ultraviolet (UVR) is recognized only as a useful tool to identify white pigments as well as to register the surface of a painting, visible luminescence induced by ultraviolet radiation (UVL<sub>VIS</sub>) allows the observation of additions and inpainting. This technique leads also to observe layers of varnish and permits to record the visible luminescence of several pigments and materials when excited under UV radiation. Reflected infrared imaging (IR) allows the visualization of the underdrawings, as well as hidden constructions and *pentimenti*, by the higher transparency of most of the pigments in this band. In some supports, as canvas or paper, transirradiation (IRT) reveals the construction process, also showing eventual underdrawings, underpaintings and *pentimenti*, permitting hence a deeper knowledge of the inner layers of paintings. Infrared luminescence (UVL<sub>IR</sub> and VIL) is used to detect certain pigments (mainly those containing cadmium, titanium dioxide in its rutile form, Egyptian blue, or Han pigments). Finally, the infrared and ultraviolet false color images (IRFC and UVFC) are useful to visually distinguish areas of a same color painted with diverse materials, allowing the mapping of specific colors, suggesting by the response the use of certain pigments and even including some information on the underdrawings in the case of IRFC.

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Although these techniques belong to different phenomena, the comparison of reflection, transmission or luminescence images is precisely useful in identifying conservation pathologies, discriminating artists' materials and studying the processes used in the creation of artworks.

The motivation for this volume arises from the absence of previous publications of a compilation nature of multiband imaging for purposes of diagnosis and examination of cultural objects. This volume will provide an overview, from the perspectives of scientists, art historians, photographers, and conservators, of how multiband imaging techniques can contribute to the examination of cultural heritage, leading also to its proper interpretation and diagnosis. The volume will also include guest contributions presenting different multi- and inter-disciplinary approaches to multiband imaging in conservation-restoration, technical art history, or in a wide sense examination or documentation of heritage objects. These insights will be illuminating for the educational, professional and museum environments, since the fundamentals of the technical and instrumental aspects of multiband analysis will be presented in the book.

In this volume papers should describe the advantages of the use of such imaging methodologies for the study of an artwork, a challenging study case, or the implementation of new approaches through experiments with filters, sources, sensors, targets, or other variables. Special attention will be given to experimental methodologies. Novel case studies are welcome, for example where multiband techniques have been decisive for the diagnosis of damages and pathologies, or where the combination of techniques, in a cross-sectional way, has been especially valuable to reveal the methodological procedures used by the artist. Limitations on the isolated techniques could also be of interest, by showing how the implementation of a wider range of imaging can cover lack of information provided by single techniques.

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## Topics

Considering the broadness of the topic, the special focus of the volume will be the potential of multiband imaging in inter-disciplinary approaches of study of polychrome heritage objects, either from a conservation, science, or technical-art-history points of view. Case studies will illustrate the potential and limitations of these techniques for use in day-to-day practice. Papers presenting case studies or projects related to the following topics are especially appreciated:

- ❖ *Multiband imaging for recording artistic methodologies, evolution of compositions, changes, pentimenti, re-use of supports, as well as the several creation phases in the execution of polychrome heritage objects.*
- ❖ *Multiband imaging for conservation diagnostics, monitoring pathologies or deterioration of materials.*
- ❖ *Characterization or mapping of materials (pigments, dyes, or other cultural materials) by means of imaging.*
- ❖ *Postproduction of images, combinations of techniques and hybrid imaging for displaying results.*
- ❖ *Recent developments of specific equipment for multiband imaging.*
- ❖ *Novel case studies which require multiband imaging to provide answers to diagnostically or technically challenging quests. Multi-technical and inter-disciplinary approaches are also welcome.*
- ❖ *Challenges and future directions in the research of imaging techniques.*

NOTE: Considering that the first volume in the Conservation 360° series was dedicated to UV-Vis luminescence imaging technique ([https://monografias.editorial.upv.es/index.php/con\\_360/issue/view/6](https://monografias.editorial.upv.es/index.php/con_360/issue/view/6)), priority will be given to those contributions presenting UV-Vis in combination with other techniques rather than alone.

## Submission

The editors of *Conservation 360°* invite potential contributors interested in publishing in this collection to submit a 500-words abstract to the publisher's website:

[https://monografias.editorial.upv.es/index.php/con\\_360/about/submissions](https://monografias.editorial.upv.es/index.php/con_360/about/submissions)

If you are interested but not certain about your contribution, please check with the editors before submitting. For further information please contact the editors.

# CONSERVATION **360°**N

## About *Conservation 360°*

Conservation 360° is a series of multi- and cross-disciplinary books on current themes in the conservation and restoration of Cultural Heritage. This series makes available technical studies to conservators-restorers, conservation scientists, art historians, professionals and students from related disciplines and provides a broad, up-to-date and rigorous perspective on topics related to the preservation of cultural heritage, its study and documentation.

*Conservation 360°* series (peer reviewed, open access and bilingual English/Spanish) aims to carry the Spanish Academic Publishing Quality label (CEA-APQ). This quality label has recently been created by the Union of Spanish University Publishers (UNE), the National Agency for the Evaluation of Quality and Accreditation (ANECA) and the Spanish Foundation for Science and Technology (FECYT) and ensures the highest scientific quality as well as the informative and editorial value of the series.

[https://monografias.editorial.upv.es/index.php/con\\_360/about](https://monografias.editorial.upv.es/index.php/con_360/about)

## Guest Editors in vol.4

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## Important dates

|   |                                    |
|---|------------------------------------|
| •Abstracts submission:                    | <b>June 15<sup>th</sup> 2023</b>   |
| •Pre-selection of papers for peer review: | <b>July 1<sup>st</sup> 2023</b>    |
| •Submission of full-length manuscripts:   | <b>October 1<sup>st</sup> 2023</b> |
| •Expected publication:                    | <b>Spring 2024</b>                 |

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## Instructions for abstract submission

- a) Abstracts should describe original, unpublished work.
- b) Authors are allowed to submit a maximum of ONE abstract as a first author and TWO as co-author.
- c) Abstracts must be written in **ENGLISH**. Authors whose native language is not English are advised to have the text proof read by a native English speaker, before submitting their abstracts.
- d) Abstracts must contain the following information:
  - AUTHOR(S) FULL NAME
  - CONTACT AUTHOR
  - AFFILIATION
  - TELEPHONE NUMBER
  - E-MAIL ADDRESS
  - TITLE OF THE PAPER
  - KEY WORDS
  - ABSTRACT (max. 500 words)
- e) Abstracts must be submitted in Word Format, Arial, 10 pt, single-spaced, left-justified. The text should not contain tabs.
- f) A maximum of 10 illustrations or tables are allowed (jpeg format, 300 ppi max.)
- g) Please indicate whether you intend your paper to be a methodology chapter or a chapter discussing a case-study.

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