COST TD1201-COSCH action (Colour and space in Cultural Heritage)
Title: **Non-Invasive Spectral Documentation of Cultural Heritage**
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Abstract: The documentation and conservation of cultural heritage artefacts requires advances in non-invasive, non-destructive analytical techniques to characterize cultural heritage materials, including substrates (paper, parchment, photographs, stone) and media (inks, pigments, colorants). The utilization of spectral imaging techniques enables the non-invasive capture of an accurate record of a range of preservation information and expands the preservation knowledge base. Spectral imaging systems developed for astronomical imaging and remote sensing have been adapted and customized for libraries and museums. The Library of Congress is using hyperspectral imaging to support preservation of cultural heritage materials. With an integrated 39 MegaPixel camera, LED illumination panels to capture high-resolution images in ultraviolet, visible and near infrared spectrum, and integrated software, cultural heritage researchers can create a spectral map of an artefact that can be linked with other non-invasive analyses.

Spectral imaging serves as a powerful, non-invasive technique for assessing the preservation, provenance and intellectual composition of heritage items and monitoring the condition of objects for enhanced preventive conservation. Advanced spectral imaging allows non-invasive characterization of material properties, providing both access and enhanced non-visible and visible information with registered high resolution digital images. This non-contact tool can non-invasively identify and characterize colorants, inks and substrates with high precision based on their spectral response, monitor deterioration or changes in parchment, paper, textiles, ceramics and other materials due to exhibition and environmental conditions, and assess previous treatments that modified the chemical and spectral responses. Preservation specialists use this system to assess the impact of required treatments on an artefact before beginning the treatment, enabling a forensic-type analysis to re-create and document the artefact's history.

The resulting spectral image cube of registered images creates a new "*digital cultural object*" – related to, but distinct from the original. The data cube and resulting processing creates accessible information to enhance the knowledge base for the curatorial and art historical perspective, while monitoring condition changes to detect changes before apparent in the visible realm. The creation of high-resolution images and characterization of deteriorated pigments allows true colour full spectrum images to be created, and with the capacity to capture data at the level of 6000 dpp, specific regions of interest can be captured within the range of spectral microscopy. The Library utilizes this system to address challenges associated with characterizing manuscript materials, including: earliest Portolan (nautical) Charts, the L'Enfant Plan of Washington D.C., Jefferson's handwritten draft of the Declaration of Independence, James Madison's debate papers, as well as textiles and other materials. It has also been used to characterize material deterioration and detect non-visible changes caused by the exhibition and storage of significant historical documents.

The Library spectral imaging program includes development of a spectral reference database and integration of data from other non-invasive analytical techniques to create a full analytical mapping of objects for non-destructive analyses of collection materials. Scriptospatial mapping of data enables direct sharing and visualization of data to support analysis, with the capture of standardized instrumentation parameters and object metadata. Processing of the data cube creates enhanced spectral features captured from the visible and non-visible regions of the spectrum. This scriptospatial concept greatly enhances the ability to share data to effectively support cross-disciplinary research collaborations and analysis.

Biography:

Fenella G. France. PhD, MBA

Dr. France is Chief of the Preservation Research and Testing Division at the Library of Congress researching non-destructive imaging techniques, and prevention of environmental degradation on collections. She received her Ph.D from Otago University, New Zealand. After lecturing at Otago, she was the research scientist for the Star-Spangled Banner project at NMAH. An international specialist on polymer aging and environmental deterioration to cultural objects, she focuses on links between mechanical properties and chemical changes from environmental damage and treatment protocols. Dr. France has worked on projects including the World Trade Centre Artifacts, Pre-Columbian mummies and textiles, the Ellis Island Immigration Museum, and work on lighting standards for the preservation of cultural heritage. She serves on a range of standards and professional committees for cultural heritage preservation and maintains close links and collaborations with colleagues from academic, cultural, forensic and federal institutions.

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