Connecting Art and Science for Humanities Research: Mapping Color in History

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Preamble

What color is the Hindu God Krishna? “Blue” would be an answer from anyone familiar with the iconography today, but which blue? How Krishna was pictorialized in color differed greatly across time and space. Our color perception is not only subjective but also period and culture- specific. The latter specificity has much to do with artisanal practices in making and using colorants in the art of painting. In searching for answers to the questions about historical usage of colorants (pigments and organic dyestuffs) in the painting traditions of South Asia, we face two immediate challenges: first, little is known about the history of pigments in Asia as the existing pigment studies and databases rely heavily on the data drawn from Western Art (see the discussion in Kim 2021; Krekel et al. 2006; Feller 1986) second, many museums with conservation labs have been conducting their analytical studies on pigments but the data is rarely shared beyond the immediate circles or shared in the manner that students of humanities and general public cannot access easily (e.g. Ravindran et al. 2011; Faria et al. 2017; Eremin et al. 2008). Thus, translating the scientific analytical data and contextualizing the pigment analysis information is the first order of business for further historical research. This is what the Mapping Color in History [henceforth MCH, https://mappingcolor.fas.harvard.edu] as a multidisciplinary digital humanities project does. At the intersection of art and science brought together through a digital humanities project, collaboration is at the heart of the MCH project. This is what we would like to share in DH 2023.

A three-legged stool

Mapping Color in HIstory is a digital platform that compiles pigment analysis data from existing and on-going research on scientific analysis of pigments with a capacity to add new data through collaboration with research centers that are engaged in pigments analysis in Asian painting and put them in a historical perspective. The MCH project builds on existing databases like the Forbes pigment database and other digital humanities initiatives like the Getty’s Thesaurus of Geographic Names (TGN) and Art and Architecture Thesaurus (AAT) and GeoNames, and makes it possible to see pigment analysis data in the geographic and historical context.

MCH takes an object-based entry method for data collection instead of a pigment-based organization scheme taken in existing pigment databases and publications. A database ontology developed for the MCH captures the complex and multi-layered hierarchic relationship between different data points, which in turn allows mapping each pigment’s appearance geographically. This can help understand previously under-recognized trans-regional connections not only in terms of trade (such as trade of colorants and other raw materials, and even pigment recipes) but also in terms of travels of religious, philosophical, and cultural ideas. MCH can help answer when and where certain pigments started appearing and became popular and how it relates to certain pictorial, cultural, religious, and economic practices. It will also generate further research questions about local and global trade connections, color symbolism, and artisanal knowledge transfer. MCH also records the historical and technical information on the analysis, providing valuable data on the history of analytical methods.

MCH is inherently multidisciplinary as it aims to bring together scientific analysis and humanistic research with computational methods and digital tools. The project can be best described as a three-legged stool: its three legs are 1) digital asset and software development, 2) conservation science research (core data), and 3) art historical research (core data). All three legs need to be equally balanced and refined to make the MCH project to function as an open research platform. We are collaborating with six museums and libraries in the US and two in India for generating and collecting analytical and art historical data.

Connecting Visual and Scientific Data with IIIF and Web Annotations

The visual display of information is central to Mapping Color in History. The International Image Interoperability Framework (IIIF) defines a set of open API standards for describing and delivering high-resolution, attributed digital objects - a natural fit for a project which relies on visual works from disparate museum and library digital collections (Appleby et al. 2022). Some partner institutions already provide IIIF-compliant resources which are easily integrated into MCH. To serve assets from institutions which do not yet provide IIIF resources, MCH utilizes a IIIF pipeline developed by the Harvard Library Technical Services team (LTS) and provided as infrastructure as a service for multiple university clients. The asset ingest and delivery pipeline was created in collaboration with partners such as MCH, HarvardX, and the Academic Technology Group. The MCH team collaborated with ATG to create a reusable Python library (Crawford et al. 2022) to generate IIIF manifests and interact with the IIIF pipeline APIs.

MCH also connects pigment analysis data to art object digital representations through IIIF-compatible Web Annotations (Sanderson et al. 2017). Connecting scientific data to digital cultural objects is difficult but necessary for researchers interested in making

the shift from visual and historical analysis to material investigation and scientific data analysis (France and Toth 2011). Using a CatchPy annotation server developed at HarvardX (Maekawa), MCH researchers annotate analyses as layers on canvases representing the works. We extended the Mirador 3 mirador-annotations plugin (Reed 2020) to include an adapter for CatchPy and to allow researchers to capture the visible color and analysis methodology (XRF, Raman, etc) associated with each annotation point. This links the annotations to our application data, so users can click on annotations within the Mirador IIIF viewer and see the associated pigments. Much like the Library of Congress' Scriptospatial Visualization Initiative, the MCH viewer layers scientific pigment analyses on top of the digital object, surfacing data that may otherwise remain locked in a pigment database (France 2017). This interface is more accessible than typical pigment databases, as researchers can see exactly where pigments appear on the work and compare analyses of different objects. These annotations will eventually allow researchers to visualize the interconnections between pigment analyses and art historical data in historically and geographically meaningful ways.

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