

Postdoctoral Fellow in Deep Learning applied to Polarized Light Microscopy, Northwestern University, University of Arizona, and M+

Despite the rise of conservation science with an ever-increasing sophistication of chemical characterization tools, for over 100 years, the polarizing light microscope (PLM) has remained one of the most important analytical techniques for identifying artist pigments. This project aims to maximize the amount of information extracted from PLM by introducing digitization and image processing protocols designed to make the data collection/interpretation process more accurate and user-friendly. By optimizing the collection of refractive index and birefringence data with machine learning methods, the desired outcome of the research would be to revitalize PLM as a state-of-the-art technique for pigment characterization and for the method to find renewed and broad applicability in conservation science investigations. In this three-year project made possible by the National Endowment of the Humanities (NEH), the postdoctoral fellow will develop a single-shot polarizing light microscope that utilizes a new machine-vision camera with polarizers attached directly to the sensors at the pixel level. To identify pigments, the fellow will develop deep learning architectures to perform multi-class classification of the pigments from the PLM image. The postdoctoral fellow will be mentored by a project team consisting of researchers specializing in signal processing (Northwestern University, Chicago), optics (University of Arizona, Tuscon), and cultural heritage (M+, Hong Kong) and will utilize the Forbes pigment archives as source material.

Essential Duties: Work directly with the project team to design and build a PLM microscope; Collect samples from Harvard Art Museums and the Art institute of Chicago; Develop procedures for image capture and annotation to make the data machine readable; Write software (in Python) to process data; Document and disseminate activities in peer reviewed journal articles and in conference presentations.

Required Education, Experience, and Skills:

- Ph.D. degree in any branch of the physical sciences
- Desire to deepen Python and deep learning programming skills
- Familiarity with PLM microscopy
- Some familiarity with computational or technical imaging is preferred but not essential
- Interest in cultural heritage science

The fellowship is commensurate with experience with a base of \$52,000 per year.

Application materials consist of a cover letter, a CV, one or two relevant publications, and the names and contact information of three references that should be uploaded to this [application link](#). The positions will remain open until filled.