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Computational Techniques for Evaluating Daguerreotypes

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Cumulative research efforts on the deterioration of daguerreotypes have revealed a variety of mechanisms for change. Copper corrosion and silver tarnish develop around the edges and in spots on the plates, glass corrosion occurs on the cover glass, and plates have been observed to develop a white haze of re-deposited silver particles. These deterioration products have been studied in detail by scientific means and significant efforts have been made to accurately capture repeatable digital images of daguerreotypes plates. Computational analysis allows for the recognition of patterns and is a promising technique for analyzing the above mentioned types of deterioration.

This project developed from a digital imaging initiative at the State Hermitage Museum, St. Petersburg, to capture high-quality, repeatable images of a set of historic daguerreotypes exhibited from December 7, 2011 to February 5, 2012. The imaging protocol was developed by Paul Messier and Jiuan Jiuan Chen and resulted in two sets of images of thirty-two plates taken before and after the exhibition. Images were made using normal and specular illumination, and the resulting digital files were compared visually by Tatiana Sayatina after the exhibition.

Computational analysis was performed by Margaret Wessling using the open-source image analysis software ImageJ. ImageJ is hosted by the National Institutes of Health and is free to download and use (http://imagej.nih.gov/ij/). The software is capable of stacking images, registering images, and analyzing images on a pixel-by-pixel basis. The goal of the project was to develop a tool that could identify the different types of daguerreotype deterioration patterns and produce quantitative information about change. Margaret Wessling and Dr. Lai Ding of the Harvard University NeuroDiscovery Center developed a program macro to measure a stack of two or three registered condition images of a daguerreotype, evaluate the stack for condition "spots" based on variables designated by the user, and produce Microsoft Excel spreadsheets with the calculated data. The macro can be downloaded via GitHub at this address: https://github.com/PaulMessier/PM_projects.

Analysis of the image stacks generated from the Hermitage Museum exhibition and from an experiment conducted by Margaret Wessling revealed the ImageJ macro is capable of identifying and quantifying change to daguerreotype surfaces. The macro readily finds spots of glass corrosion, copper corrosion, and surface accretions of various kinds. The macro is not currently able to evaluate silver tarnish rings. Evaluation of the data collected from the image sets revealed the numerical values calculated are reliant on the measurement parameters designated by the user. Comparison of the data between the daguerreotypes reveals outliers that experienced greater than average change during a period of time. The authors correlate these statistical outliers to daguerreotype packages that may be more dynamic due to poor sealing or other internal effects. The ImageJ macro is therefore a useful tool for documenting daguerreotypes and

making decisions regarding rehousing. The macro may also be used for other objects that share similar attributes such as 2-dimensionality, and condition issues that form in "spots".

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