

## REPORT

### **Imaging Practitioners Meeting on 30 March 2001 to Consider How the Quality of Digital Imaging Systems and Digital Images May be Fairly Evaluated**

S. Chapman, full report submitted to DLF May 23, 2001

#### **Overview**

By 1998, several consortia recognized that significant investments were being made to digitize pictorial collections in libraries, archives and museums. This activity was and continues to be highly decentralized. In the absence of guidelines or best practices for image digitization, one concern was whether these collections would be interoperable: were images being made in formats that could be easily distributed? And to a baseline level of quality that would meet users' requirements? If one looks back even earlier to the experiences of MESL and other projects to create and exchange visual images, it seems that the focus shifted at one point from making digital images to making good digital images.

With these issues of imaging investments in mind, the Digital Library Federation, CLIR and the Research Libraries Group sponsored a series of imaging guides that were published in July 2000. The guides were designed to help make project managers and technicians aware of the decisions—e.g., selecting and setting up equipment—that would have the greatest impact upon image quality. Parallel to this effort, a NINCH working group had been advancing its efforts to codify best practices for digitizing cultural heritage materials and was eager to receive feedback from the practitioners with the greatest amount of field experience.

The purpose of this DLF-sponsored meeting was to establish a forum for expert practitioners to exchange ideas about what is “good” and, if possible, to prioritize where tools, applications, and training would be of greatest benefit to meet our institutions' obligations to make digital reproductions of consistent quality and persistent utility.

#### **High-level statement of the problem**

Don Williams, an image scientist from Eastman Kodak who facilitated the meeting, spoke both for imaging practitioners and for imaging scientists and other members of standards committees when he noted, “There appears to be somewhat of a consensus that there is not any reasonable way right now to look at all imaging performance measures without ambiguity.”<sup>1</sup> Subjective assessments are notoriously flawed, due not only to differences among human observers, but to limitations of devices that render images (monitors, printers), as well as the differences in ambient lighting in two or more viewing environments.

Objective methodologies are also imperfect. Although quantifiable metrics are well defined in the scientific community—and currently receiving greater endorsement by standards organizations—it is currently very difficult to use tools to measure imaging performance in real-world production environments. Making an analogy to changes in auto manufacturing, Don

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<sup>1</sup> In this context, “imaging performance” refers to the actual outputs of a system component (such as a lens) or of the entire imaging system.

pointed out that photographers no longer know “what’s under the hood” in their imaging systems. It is difficult enough to find tools to interrogate imaging performance—in key areas such as noise, density and dynamic range—but even more problematic to subtract the errors that may have been inadvertently introduced by the process itself. Does a noise measurement, for example, refer to the imaging system or the noise generated by a target that was digitized?

Intentional or unintentional use of imprecise terminology also creates ambiguity. For example, industry’s marketing literature and our community’s funding guidelines routinely associate image quality with unreliable metrics—such as resolution and bit depth. These performance characteristics refer to input settings and become ambiguous if used to describe output quality. The same source could be digitized by two systems that produce the same nominal results (e.g, 3,000 pixel, 24-bit RGB images) yet the quality of the images may differ significantly.

Finally, as Ron Murray would point out at the meeting, there is a potential to confuse measurements with judgments (how people see images and whether they will be satisfied). The challenge is to integrate these two perspectives of quality into methods for quality control.

Several challenges brought imaging experts to this forum: to improve upon the conventions used to describe and distinguish the performance of various imaging systems; to institutionalize methods to monitor performance of equipment; and to simplify the task of evaluating images, particularly those produced outside of known workflows.

### **Meeting Discussion and Outcomes**

Twenty-one participants representing two commercial, four museum, and five library/archives studios attended the meeting. Despite the differences in institutional missions, client demands, and characteristics of source materials, the photographers and production managers identified a number of common practices and common challenges to digitizing historic materials. The meeting established without question that there is a single community of expert practitioners who benefit from opportunities to exchange ideas, share knowledge, and collaborate to refine practice.

Much of the discussion focused on what Don Williams referred to as “key performance metrics” to judge the quality of imaging systems (both hardware and software). The photographers largely agreed with these metrics in principle, but identified a number of limitations to implementing them in practice. Despite the prevalence of targets (grayscale and color bars) to anchor image quality and image processing, this practice receives only a qualified endorsement. In short, experts pointed out the key dependencies that must be addressed when applying key metrics. The major ones include: requirements to manufacture targets of materials similar to the artwork being photographed; regular instrument calibration, including redundant measurements; education and training; and development of software that is easy to use in a production environment.

The group agreed unanimously to move ahead on several fronts, with the expectation that each activity will develop necessary foundations for information exchange, standards development, and testing to precede application development.

Action will be taken to:

- establish a listserv (dlf-image) for imaging practitioners working with historic materials
- undertake a collaborative experiment to determine whether ISO 16067-sanctioned tools (slanted-edge target and Auto SFR software) work in a variety of production environments
- liaise with ISO standards committees: draft a letter informing committees of the volume of (non-consumer based) work being done in our community and the obstacles that need to be overcome for reliable image exchange
- collaborate to draft requirements for—or perhaps even develop—targets of materials (spectral response, contrast, size) similar to the historic materials we are asked to digitize
- meet again, pending support, at the Art Institute of Chicago in the fall

### List of Participants

Sally Bjork  
Photographer  
University of Michigan  
734-647-9989  
[sbjork@umich.edu](mailto:sbjork@umich.edu)

Dan Johnston  
Senior Photographer (and manager)  
University of California, Berkeley  
510-643-9314  
[djohnsto@library.berkeley.edu](mailto:djohnsto@library.berkeley.edu)

Steve Chapman  
Preservation Librarian for Digital Initiatives  
Harvard University Library  
617-495-8596  
[stephen\\_chapman@harvard.edu](mailto:stephen_chapman@harvard.edu)

Erik Landsberg  
Senior Fine Art Photographer (and manager)  
Museum of Modern Art  
212-708-9489  
[erik\\_landsberg@moma.org](mailto:erik_landsberg@moma.org)

Bill Comstock  
Manager, Digital Imaging Group  
and Photography Studio  
Harvard College Library  
617-496-5241  
[comstock@fas.harvard.edu](mailto:comstock@fas.harvard.edu)

Lee Mandell  
Programmer/Analyst  
Harvard University Library  
617-495-3724  
[mandell@fas.harvard.edu](mailto:mandell@fas.harvard.edu)

Franziska Frey  
Research Scientist  
Image Permanence Institute  
716-475-2302  
[fsfp@rit.edu](mailto:fsfp@rit.edu)

David Mathews  
Photographer  
Museum of Fine Arts, Boston  
617-267-9300  
[dmathews@mfa.org](mailto:dmathews@mfa.org)

Hans Hansen  
Chief Technology Officer  
Octavo  
510-251-6033  
[hansen@octavo.com](mailto:hansen@octavo.com)

Jan Merrill-Oldham  
Malloy-Rabinowitz Preservation Librarian  
Harvard University Library  
617-495-7657  
[jmo@harvard.edu](mailto:jmo@harvard.edu)

Phil Michel  
Digital Conversion Specialist (and manager)  
Library of Congress Prints & Photographs  
202-707-8917  
[pmic@loc.gov](mailto:pmic@loc.gov)

Stephanie Mitchell  
Photographer  
Harvard College Library  
617-496-9346  
[stephanie\\_mitchell@harvard.edu](mailto:stephanie_mitchell@harvard.edu)

Ron Murray  
Scientific Photographer, Librarian  
Library of Congress Preservation Directorate  
202-707-9610  
[rmur@loc.gov](mailto:rmur@loc.gov)

Alan Newman  
Executive Director, Imaging Dept.  
Art Institute of Chicago  
312- 443-7247  
[anewman@artic.edu](mailto:anewman@artic.edu)

Steve Puglia  
Preservation and Imaging Specialist  
National Archives and Records Admin.  
301-713-6712  
[steven.puglia@arch2.nara.gov](mailto:steven.puglia@arch2.nara.gov)

David Remington  
Photographer  
Harvard College Library  
617-496-9346  
[remingt@fas.harvard.edu](mailto:remingt@fas.harvard.edu)

Mark Roosa  
Director for Preservation  
Library of Congress  
202-707-7423  
[mroo@loc.gov](mailto:mroo@loc.gov)

David Semperger  
Project Manager  
Boston Photo, Inc.  
617-267-4086  
[dsemp@bostonphoto.com](mailto:dsemp@bostonphoto.com)

Peter Siegel  
Manager, Digital Imaging and Photography  
Harvard University Art Museums/  
Harvard Fine Arts Library  
617-495-4846  
[siegel@fas.harvard.edu](mailto:siegel@fas.harvard.edu)

Don Williams  
Imaging Scientist  
Eastman Kodak Company  
Imaging Research and Development  
716-477-7446  
[wilyums@rochester.rr.com](mailto:wilyums@rochester.rr.com)

John Woolf  
Digital Imaging Specialist (and manager)  
Museum of Fine Arts, Boston  
617-267-9300  
[jwoolf@mfa.org](mailto:jwoolf@mfa.org)