

*First Interim Report
to The Andrew W. Mellon Foundation*

**THE DP3 PROJECT:
DIGITAL PRINT PRESERVATION PORTAL**

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INTRODUCTION TO THE PROJECT

This is the first year interim report on the “The DP3 Project: Digital Print Preservation Portal.” This three-year \$606,000.00 grant is a major research and development project dealing with the preservation of modern digitally printed materials: inkjet, dye diffusion thermal transfer (“dye sub”), and color electrophotographic. This project is intended to help all conservators, curators, archivists, librarians, and collection managers better understand and care for these objects in their collections. This report covers the period from November 1, 2007 to October 31, 2008.

The research focuses on the potential harmful effects on digitally printed materials of light, heat, airborne pollutants, and humidity extremes. The ultimate goals of the project are to create a set of science-based recommendations to help cultural heritage institutions make collection care decisions and to publish this information on a new and unique website, *The DP3 Project: Digital Print Preservation Portal*. In addition to the experimental results, the website will also contain tools to aid in print identification, a glossary of terms related to digital print deterioration, an extensive bibliography, a FAQ section, and links to additional helpful information and organizations.

The following is a short review of the work outlined in the original proposal. There are four stages to the project:

- 1) **Preparatory** – In this stage, experimental equipment necessary to the project and described in the original project proposal will be purchased, installed, and calibrated at IPI. Any necessary training will also be concluded during this time. Additionally, a large number of printing papers need to be collected to create the test sample population. These samples will be printed at IPI or other departments at RIT, or, when unavoidable, obtained from sources outside of RIT.
- 2) **Experimental** – In this stage, experimental work will be performed to understand the behavior of these materials over time. As mentioned above, a variety of print characteristics and vulnerabilities are being explored. This experimental phase can be further categorized into four separate areas:
 - a. Light
 - b. Heat
 - c. Air pollutants
 - d. Humidity Extremes
- 3) **Website Development** – in this stage, which will run concurrent to the first two stages, the website and its content will be created.
- 4) **Reporting** – IPI will provide scheduled interim and final reports to the Andrew W. Mellon Foundation, and will seek, as well, additional venues for results dissemination at conferences and through professional publications of interest to archives, museums, and libraries at the national, state, and local levels.

PREPATORY STAGE

In order to perform the experimental work, IPI needed to acquire test equipment to supplement its current capabilities. These fell into two categories: environmental exposure apparatus and measurement devices. For environmental exposure apparatus, IPI purchased a Q-Lab xenon light test unit with chiller. This system will allow room-temperature testing of digital print samples under very high illumination. Many commercial xenon test systems operate only at high temperature, so the results would be erroneous for digital prints, which are extremely sensitive to desiccation at high temperature. The unit IPI purchased is now fully installed, and training of IPI staff on proper use and maintenance has been completed.

IPI is also having its existing pollution test chambers updated to the requirements needed for this project. When IPI first had the chambers built in 1990 they were state of the art. However, because digital prints are far more sensitive to pollutant damage than traditional prints, a thorough update of the chambers and their computer control systems was required to insure precise chamber air flow, gas concentrations, and gas purity. The updating process is not yet complete as some parts have been hard to obtain and other parts have required custom manufacture. IPI estimates that the system will be functional by the end of 2008 and believes that project results will still be completed on time.

A low humidity chamber was also needed to test digital prints at low humidity and in cycling humidity. This chamber has also been purchased. Installation is nearly completed and training of IPI staff on its use and maintenance will be performed shortly. There had been some delay in receiving the unit as the time to deliver was almost three months longer than originally estimated by the manufacturer.

Apart from the environmental exposure equipment, IPI also purchased two measurement instruments for the project. The first is an image analysis camera used to measure ink bleed effects at highly magnified levels. This device can also be used to characterize the shapes and numbers of image forming dots in order to better understand image formation in prints. This knowledge will aid in the development of print identification schemes. IPI also purchased a high-speed colorimeter. This device will be used to measure changes to image color after exposures to light, humidity, and airborne pollutants. Having a high-speed unit will allow IPI to measure a larger set of samples, thereby increasing the accuracy and applicability of the final results.

Finally, IPI has acquired equipment for its imaging lab to expand our suite of imaging techniques to characterize digital prints visually. The newly purchased equipment consists of a digital SLR and UV-illuminated copy stand system. The UV system will be used to examine prints for the presence of optical brightening agents and photograph the effect for educational tools for the project audience. IPI is already using the system to create images for the print identification tool on the DP3 website.

As stated above, the experimental test targets used in the project will be either printed at IPI or another RIT department or, when unavoidable, obtained from other sources. The advantage of in-house target creation is the ability for IPI to provide rigorous control over

sample handling. IPI has purchased a variety of printers and identified sources for all material types it cannot generate internally. Most of the additional samples can be generated at other RIT departments, helping to reduce potential contamination or damage before the experimental work is performed. However, some samples cannot be generated at IPI or RIT.

IPI has purchased all of the printers it needs for this project as well as all of the printing papers (though some additional stock may need to be purchased as the project progresses). These printers represent all major technologies and their sub-groups. Additionally, a wide variety of printing papers have been obtained that represent all types of uses (documents, photo) and physical appearances (glossy, matte, warm-tone). The printers have been installed and have already been used to create test targets for the light-fade portion of the experimental work. The papers also have been used to begin the thermal stability (heat) tests (these samples are not printed, as per the originally proposed methodology).

EXPERIMENTAL STAGE

Light

The first phase of the experimental work, consisting of exposing test samples to high-intensity xenon light, has begun. In this preliminary test, IPI is evaluating the function of the unit, the function of the new measurements devices, and the test target design. This phase is expected to be finished before the end of 2008. The second phase, to start in January 2008, will include a larger variety of printed samples representing the various digital print technologies and printing papers necessary to draw general conclusions about the effects of light on these objects. The second phase of the light-fade experiment will also include exposure to fluorescent light sources.

Heat

Approximately 11,000 thousand samples have begun long-term incubations at various elevated temperatures for the heat tests. This is one of the largest sample sets IPI has ever tested. These samples, representing a very large selection of modern digital printing papers, will be monitored for discoloration over time. The use of multiple temperatures will allow IPI to make year predictions regarding time to unacceptable yellowing for the various paper types and technologies. Additionally, IPI is performing these tests at various levels of humidity (20%, 50%, and 80%) to quantify the effects of humidity in storage.

Air Pollutants

As discussed above, the pollution chambers are not yet ready for the experimental exposure of test samples. Testing for sensitivity to air pollution should begin in January 2009.

Humidity Extremes

The first tests for effects of humidity extremes have begun with the heat tests as described above. Those tests will only examine the role of humidity in the yellowing of digital print papers. The more critical effect of exposure to high humidity, however, is

colorant bleed. Preliminary tests for high-humidity bleed are currently being done to examine test target design. It is hoped that improvements to the test target will provide additional insight into the manifestations of decay that occur under this environmental stressor. Tests for the damaging effects of humidity cycling will begin in January 2009.

WEBSITE DEVELOPMENT STAGE

A rough version of the DP3 Project website has been created including the design of the site's visual appearance and the navigation strategies. Sub-sections with informative articles on digital printing technologies, a glossary, and a bibliography are also currently being created.

An identification system for digitally printed materials is also being developed. Example images of the various technologies along with various detail images of digital prints are being collected to provide the website's users with a variety of ways to examine, understand, and identify the different digital print types.

REPORTING STAGE

All of the tests in this project require exposure of the test samples to environmental stresses for long periods of time. In some cases, the exposures will be slightly over two years. Thus, no results have been completed from the experimental portion of the project, and reporting cannot yet begin.

IPI has begun developing an email list of interested institutions and individuals in order to keep them up to date on the progress of the work and to provide notification upon project completion. So far, over 150 individuals and institutions have submitted their email addresses.

A SURVEY OF DIGITAL PRINT EXPERIENCES IN CULTURAL HERITAGE INSTITUTIONS

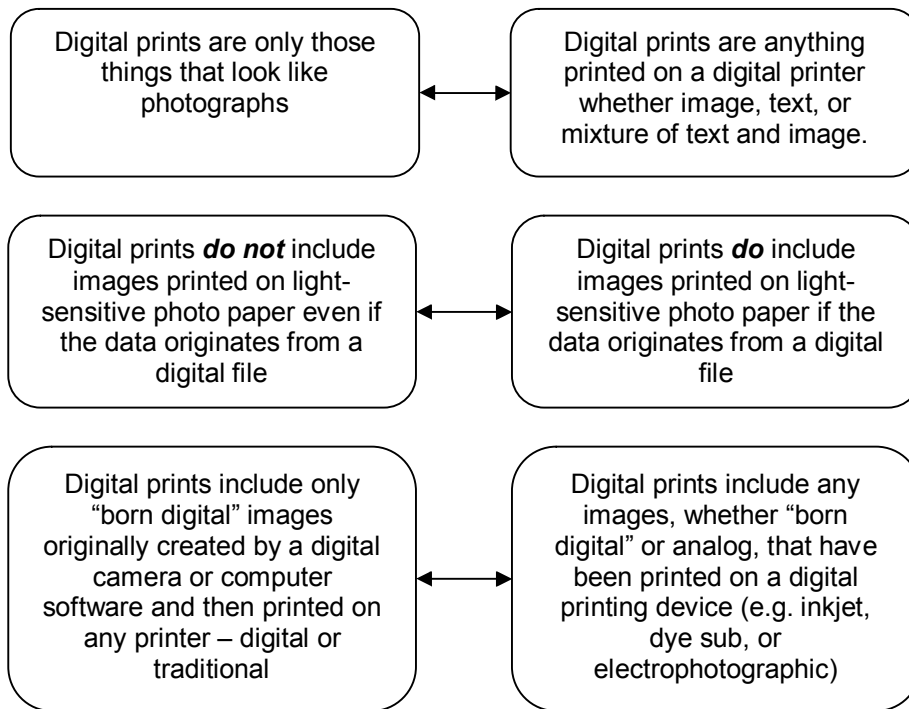
While waiting for the experimental apparatus to become operational, IPI conducted a survey of the field to quantify the experiences that cultural heritage institutions have already had with modern, digitally printed materials. This included both materials that have entered institutional collections from outside sources or that have been created by the institution for internal use. The experiences considered included the ability to identify prints made by the various digital printing technologies, anecdotal evidence of print deterioration in collections, and institutional usage policies for digital prints (storage, handling, display, etc.).

Invitations to participate in the survey were submitted to a variety of professional organizations' online discussion groups. In addition, email invitations were sent directly to 103 specific professionals in the field, as some may not read the posts on the professional sites. IPI received a total of 182 responses to the survey.

Key findings from the survey:

- Almost all institutions have digitally printed materials within their collections.
- The most prevalent print type is inkjet.
- Most institutions do not feel well informed regarding the care of these materials.
- Most institutions do not have special care policies for digitally printed materials.
- The majority of institutions have already seen a variety of deterioration effects within their collections of digitally printed materials.
- Nearly all institutions use digital printers internally.

The most important lesson learned from the survey was that there is no common definition for the term *digital print* within the field. In fact, there were many contradictory definitions. The definitions seemed to be grouped into three dichotomies:



The mutually exclusive nature of these dichotomies presents a serious communication problem within the field and needs to be addressed. While IPI could offer suggestions for a common definition for the term *digital print*, it would be inappropriate for us to attempt to force a definition on the field. At the very least, however, IPI needs to create a clear definition to be used in the DP3 Project to provide internal consistency as well as a point of reference, so that those who define the term differently may still find the information they need to care for their collection. A definition specific to the project will be included on the DP3 website. The final wording of that definition is still under consideration.

As an additional result of the questionnaire, IPI has identified a set of volunteers willing to participate in future questionnaires. IPI will use this opportunity to receive feedback on development of the website before launching the website for the general public. This will enable IPI to ensure that the DP3 Project results are in a truly useful form that will enable all institutions to care for their modern printed materials.

IPI has submitted a summary of the survey for presentation at the Society for Imaging Science and Technology Archiving 2009 Conference in Washington, DC in May 2009. A full report on the survey will subsequently be published on the DP3 Project website.

INTERIM PROJECT CONCLUSIONS

The installation, calibration, and testing of all new experimental apparatus is nearly complete. The purchase of a wide set of printers and printing media for testing is also complete, and sources have been identified for additional print types that cannot economically be created at IPI. Using the collected equipment and materials, exposure of digital prints to light and heat has begun. Concurrent to the above, a draft version of the DP3 Project website has been created, and content providing general education on digital printing has been drafted. This includes development of an online tool to aid professionals in the identification of the various print types. Finally, IPI conducted a survey of professionals in the field that has not only validated the necessity of this project, but has also provided further insight into the field's experiences with this growing portion of institutional collections.