

David Livingstone 1870-71 Field Diary and Select Letters
Spectral Imaging
Statement of Work
12 May 2010

1. Scope

This statement outlines the work necessary in 2010 for the spectral imaging and digital processing of David Livingstone's 1870-71 Field Diary and Select Letters with an integrated spectral large-format imaging and LED illumination system. This project will provide a high-quality digital archive with full metadata designed to ensure the long-term digital preservation of Livingstone's manuscripts and, additionally, is intended to enhance Livingstone's faded handwriting over the printed text of *The Standard* and other printed materials. Supported by a grant from the US National Endowment for Humanities (NEH), this imaging work will be carried out with the approval of the owners of the David Livingstone 1870-71 Field Diary and Select Letters, and in close collaboration with the repositories of these documents: The David Livingstone Centre in Blantyre, and the National Library of Scotland in Edinburgh. The data storage, access and retrieval is a critical component of the NEH grant but not addressed in this SOW. There are approximately 180 pages or portions of pages to image:

From the David Livingstone Centre, Blantyre:

- 1) Field Diary 1871, pages CII to CXV and CXX-CXXXIII, CXXXII to CLXIII: 15 sheets double-sided, each sheet 1/4 the size of a newspaper page,
30 sides to image; two images per side, plus possible 30 full sheet macro images
 - 2) Field Diary 1871, pages CXVI to CXIX: 2 sheets, double-sided, each 1/8 of a newspaper page,
4 sides to image
 - 3) Field Diary 1870, pages XVII to XX, 1 sheet, double-sided
2 sides to image
 - 4) Field Diary 1870-71, pages XIV, LXII to LXIX, LXXVI
10 sides, each the size of the page of a regular book
 - 5) Field Diary 1871, loose sheet, unnumbered
2 sides, each about the size of the page of a regular book
 - 6) Field Diary 1870, 35 sheets, double-sided
Number of sides to be determined because small size of pages would allow for multiple sheets in one image
- Total: 78 Side Equivalent + the sides of #6

From the National Library of Scotland, Edinburgh:

- 1) MS. 10703:
Approximately 94 sides, each the size of the page of a regular book
 - 2) A few letters from the same period may also be imaged:
 - a. DL to John Kirk, 13 Feb. 1871, MS. 10701, f.154
 - b. DL to Agnes Livingstone, Mar. 1871, MS. 10707, f.85
 - c. DL to John Kirk, 25 Mar. 1871, MS. 10768, f. 80
 - d. DL to John Kirk, 14 May and 26 June 1871, MS. MS. 10768, f. 81
 Approximately 8 sides to image
- Total: Approximately 102 Sides

1.2 Background

The technically complex Archimedes Palimpsest Program has adapted advanced digital imaging and data processing to studies of the Archimedes Palimpsest. During the nine years of effort, spectral imaging capabilities have been refined and adapted to meet the needs of the scholars and provide best value for the program. Based on this work, work at the Library of Congress and studies of David Livingstone documents already carried out, the imaging system has been further refined to image David Livingstone's 1870-71 Field Diary and Select Letters and process the images to enhance Livingstone's text.

2.0 Program Management

The imaging program will be managed by Michael B. Toth, in close coordination with NEH Livingstone Project Director Adrian Wisnicki, and the owners of the David Livingstone 1870-71 Field Diary and Select Letters, as well as the repositories of these documents: The David Livingstone Centre and the National Library of Scotland. Administrative support will be provided through Michael Phelps of the Early Manuscript Electronic Library, with funding provided by the US National Endowment for the Humanities.

3.0 Imaging Tasks

3.1 Imaging

Camera: Image collection will be performed with a MegaVision E6 39 megapixel camera back (7216 × 5412 pixels; 16-bit data with approximately 12 bits of dynamic range), which will be mounted in a technical view camera on a copy stand. We propose to use a 60mm UV-VIS-IR lens. A color filter wheel will be installed for UV fluorescence studies.

Lighting: Illumination will be provided by two EurekaLight LED panels at 13 narrow bands of wavelengths (ultraviolet band at 365nm, 7 visible bands at 445 nm, 470 nm, 505 nm, 530 nm, 570 nm, 615 nm, and 625 nm, and 5 near-infrared bands at 700 nm, 735 nm, 780 nm, 870 nm, and 900 or 1050 nm - TBR). Raking light panels will also be used for those images that are not laminated. The nonthermal generation of light in the diodes ensures that no heat from the illumination system is applied to the manuscript pages during imaging. The LED panels will be placed in symmetric downward-looking positions angled approximately 45° on either side at distances in the range of 3 to 6 feet. Diffusers will be used to create uniform and nondirectional light fields. This illumination system will require a darkened room, and eye protection must be worn by all present during imaging.

Image Collection Software: The host software for the sensor is PhotoShoot from MegaVision, which will orchestrate the operation of both camera and lighting through FireWire and USB connections, respectively. PhotoShoot is designed to ease user tasks such as image sequence setup, imaging parameter entry, focus and image inspection, collection and organization of metadata, and image conversion and storage. NLS and David Livingstone Centre personnel will be trained in the operation of the imaging system.

3.2 Image Production and Processing

The goal of the digital processing, which will coincide with the imaging of the original documents and continue when the imaging team returns to the United States, is to enhance and digitally reproduce oertext and areas of scholarly interest from David Livingstone's 1870-71 Field Diary and Select Letters. They will also quantify the ink to provide spectral

properties and samples to compare against ink databases in the Library of Congress. Baseline production uncropped and registered 8-bit TIFF digital images will be provided for all illuminations. Pseudocolor hyperspectral images will also be produced using image processing tools to highlight leaves of interest that have significant spectral differences. The processing will be performed using custom and off-the-shelf image processing software to provide TIFF images viewable with standard image viewer software or browsers.

3.3 Image Registration and Storage

The imaging data set obtained using the standard collection should be approximately 1-2 GB per image, for a total of approximately 300 Gigabytes for all raw image data. With processed images, the image set will probably total at least 500 GB. The final image set for Livingstone Online and users will be smaller in size, with 8-bit TIFFs, JPEGs and processed images. All original and processed images will be registered and uncropped multiseparation image cubes will be created in the TIFF 6.0 imaging standard. The images will be stored and disseminated on external disk drives. Some images will be hosted on an RIT server for broader sharing with other scientists and scholars on the Internet during imaging. For long-term digital preservation, the images and transcriptions will be hosted on the Internet in “flat files” that are not dependent on any specific GUI.

4. Metadata Preparation

Metadata related to all images will be generated during imaging per the Archimedes Palimpsest Metadata Standard. These will include all standard information now provided for the Archimedes Palimpsest, including spatial reference data unique to these images. In addition, the owners of the original manuscripts will cite any additional metadata requirements, which the imaging program will attempt to address.

5. Deliverable Items

Files of all images will be provided to the document owners in electronic high-resolution TIFF image format on portable hard drives. Images of a lower, but still good quality resolution will be made available on Livingstone Online for broad access and study. All data will be hosted online at TBD site.

6. Key Personnel

The key personnel for this project include Project Director Adrian Wisnicki of Birkbeck College and Fordham University, New York; Program Manager Michael B. Toth of RB Toth Associates, Oakton, VA; Imaging Scientists Dr. William Christens-Barry of Equipoise Imaging of Ellicott City, MD, Dr. Roger L. Easton, Jr. of the Rochester Institute of Technology in Rochester, NY, , and Dr. Keith Knox of Kihei, Hawaii; Camera Engineer Ken Boydston of MegaVision Inc., Santa Barbara, CA; Data Manager Doug Emery of Emery IT of Baltimore, MD; and Scholar and Public Relations Director Dr. Debbie Harrison, Birkbeck College.

7. Permission to Image and to Publish

Permission to image the original documents and to publish them as part of a critical edition of the relevant documents through *Livingstone Online* will be secured from the owners of the original manuscripts and from the copyright holder for Livingstone’s literary works before the imaging begins. All intellectual property rights to the raw and processed images will reside with the Owners of David Livingstone’s 1870-71 Field Diary and Select Letters. All images will be credited to the respective owner with Creative Commons Attribution-Noncommercial

3.0 Unported License. This includes use in scientific and scholarly papers and studies of imaging techniques and the contents of the images.

8. Dependencies

- **Handling:** The owner's and/or document repository's representatives will transport (in the case of the David Livingstone Centre documents) and handle the leaves in a timely fashion at the request of the imaging team. The camera system will be handled by imaging team personnel.
- **Metadata Requirements:** As noted above, metadata related to all images will be generated during imaging per the Archimedes Palimpsest Metadata Standard. Any additional metadata requirements will be provided by the owners of the manuscripts prior to the imaging for possible inclusion in the metadata set.
- **Facilities:** The setup and operation of the imaging equipment will be done at the National Library of Scotland in the Reprographics Studio. Desk space will also be required elsewhere in the library for the setup of two of the team's laptop computers and hard drives for copying and processing the image data.
- **Internet Connectivity:** LAN connectivity to the Internet with the ability to transfer files externally via FTP will be required for one laptop in the Reprographics studio. Wireless or LAN access will be required for the other team laptops.
- **Imaging Support:** Interested personnel from the NLS, David Livingstone Centre, and/or NTS will be trained in the operation of the imaging system to ensure thorough knowledge of and additional insight into the imaging capability. Otherwise this work will be carried out by members of the imaging team.

9. Schedule

Imaging will be conducted at the National Library of Scotland for a period of six to seven 7 working days on mutually acceptable dates, during the period 22 June to 4 July 2010.