

Livingstone's 1870 Field Diary and Select 1871 Letters: A Multispectral Critical Edition

Significance and Impact

We are applying for an NEH Scholarly Translations and Editions Grant in order to develop an online critical edition of David Livingstone's 1870 Field Diary and select 1871 letters. This publication will conclude the already successful work of the peer-reviewed, NEH-funded Livingstone Spectral Imaging Project (2010 - Present). The project, in the words of one reviewer for NINES, the leading digital resource aggregator for nineteenth-century studies, "combines new spectral imaging technology, sophisticated web design, and good old fashioned meticulous scholarship." Our overarching goal is to provide critically-edited, annotated, and contextualized access to a selection of fragile, partly illegible manuscripts produced by Dr. David Livingstone (1813-73), the Scottish writer, abolitionist, missionary, and explorer of Africa.

Our new critical edition will feature a comprehensive scholarly apparatus that includes annotated transcriptions of Livingstone's 1870 diary and 1871 letters, a range of critical essays, and processed spectral images that clarify Livingstone's manuscripts and shed light on the history of their production and preservation. The application of spectral imaging technology -- which our project is among the first, if not *the* first to apply to nineteenth-century British works -- is ideal for studying Livingstone's manuscripts because it can both increase legibility and highlight the physical details of the manuscript: different layers of handwritten and printed text, the warping topography of the page, environmental traces on the page surface, and the characteristics of the various papers and inks used by Livingstone.

To develop the edition, we will create new "processed" spectral images of the 1870 Field Diary and 1871 letters by using "raw" data collected in our previous project phase, then use the new images along with extensive contextual research and analysis as the basis for our apparatus. A user-friendly interface will allow scholars and the general public to study all critical materials produced for the proposed edition. Finally, integration of new image and transcription data into our existing spectral image archive will ensure that our data is interoperable with other digital projects and will be preserved long into the future.

The 1870 Field Diary and 1871 letters represent a unique primary resource for a range of topics, thanks to Livingstone's expansive interests as an explorer. These topics include the politics and practicalities of British imperialism; the histories, cultures, and economies of pre-colonial Central Africa; the impact of the Zanzibar-based slave trade on African societies; and nineteenth-century medical, geographical, and environmental history. However, the diary and letters also present Livingstone at one of the lowest and least understood periods in his career. Chronically ill, depressed, isolated, and desperate, the Livingstone in these manuscripts emerges as a much more complex, human figure than the saintly abolitionist icon bequeathed to us by the Victorians. New insights into these aspects of Livingstone's character promise to enrich critical understanding of late-Victorian abolitionism and the creation of Livingstone's enduring public image by the Victorian press.

In publishing the new edition, we will maintain the academic standards established by our previous two publications, *Livingstone's 1871 Field Diary: A Multispectral Critical Edition* (UCLA Digital Library, 2011-12) and the *Livingstone Spectral Image Archive* (UCLA Digital Library, 2011-12). Both have drawn praise for their rigorous and innovative scholarship and use of technology. Our project has featured in articles from *The New York Times*, *The Washington Post*, *BBC News*, the Associated Press, and many other public media outlets. Specialists have also lauded our work, as best exemplified by a forthcoming review in the *Journal of Victorian Culture*. This review notes that our project is "[g]roundbreaking in its interdisciplinary techniques, traditional in its devotion to careful textual editing," and that the project "brings us closer than ever before to the blood, sweat and ink of Livingstone's literary legacy, while simultaneously forging new paths towards our digital future."

David Livingstone's 1870 Field Diary and Select 1871 Letters: A Multispectral Critical Edition
Project Narrative

A. Substance and Context

A.1. Need for the Proposed Edition. While exploring in Central Africa in 1870 and 1871, Dr. David Livingstone ran short of writing paper and ink. Livingstone (1813-73), the Scottish writer, abolitionist, missionary, and explorer, was hundreds of miles from the coast and had not made contact with other Europeans for several years. In order to continue his diary, he was forced to write over scraps of paper such as pre-printed book pages, newspaper pages, maps, and old letters. When his supply of iron gall ink ran low, he improvised by creating new ink out of an African clothing dye. Thanks to these measures, Livingstone -- today one of the most celebrated and admired explorers of the Victorian era -- was able to record in his field diaries his intimate thoughts, produce a detailed assessment of his deteriorating health, and lay out his geographical theories of Central Africa. He also noted his observations on culture, society, and politics in Central Africa, where he had the distinction of being the first European visitor.

Despite the fact that both Livingstone's 1870 and 1871 Field Diaries survive to the present day, his improvised composition methods have not stood the test of time. Currently, both diaries are in a fragile state. Their pages, which were subjected to adverse African environmental circumstances, are crumbling, and significant portions of Livingstone's handwritten text have become illegible or difficult to read due to fading, blotting, bleed through, water damage, and other problems. Even when visible, Livingstone's words are obscured by the printed newspaper and book texts over which he wrote. Due to these features, the diaries present significant challenges to detailed study. For the same reasons, however, the diaries have become among the most iconic documents of Victorian global exploration. In a manner comparable to few other Victorian manuscripts, the physical condition and visual appearance of the diaries testify to the arduous circumstances under which Livingstone and other Victorian explorers around the globe sometimes labored. As a result, the diaries make essential reading for scholars and general

audiences interested in the practicalities of nineteenth-century European colonization as well as pre-colonial African history and the arrival of the Zanzibar-based slave trade in Central Africa.

The Livingstone Spectral Imaging Project (2010 - Present)¹ -- a project primarily funded by an NEH Digital Humanities Start-Up Grant -- has already developed and released two peer-reviewed digital publications to preserve and provide critically-enriched access to these unique diaries. The first, *Livingstone's 1871 Field Diary: A Multispectral Critical Edition* (UCLA Digital Library, 2011-12),² combines advanced imaging technology, rigorous scholarship, and sophisticated web design to restore the full text of the 1871 Field Diary, develop an extensive critical apparatus, and make all these materials accessible to a worldwide audience. The second, the *Livingstone Spectral Image Archive* (UCLA Digital Library, 2011-12),³ gathers all the core image and transcription data produced by the project team into a structured database built to international library standards and focused on long-term digital preservation.

Now we would like to continue this work. An NEH Scholarly Translations and Editions Grant would enable us to create and publish a critical electronic edition of Livingstone's 1870 Field Diary and a selection of five contemporaneous letters. The proposed edition, like the previous publications produced by our project, would use advanced image processing technology to restore and enhance the study of Livingstone's original manuscripts, provide a broad assortment of critical materials, and make both the manuscripts and secondary materials accessible, discoverable, and freely available on the internet. Our underlying core data would also be published independently of the critical edition interface, in a manner that meets international digitization standards and that would allow for the data to be sustainable in the long term and interoperable with other digital projects and applications.

The need for a new edition of all Livingstone's final field (1866-73) diaries has been championed for decades by leading scholars of imperial literature and history, including Tim Jeal, Dorothy Helly, and Roy Bridges, all of whom have been highly supportive of the previous work of the Livingstone Spectral Imaging Project. The 142-year-old standard source for all of Livingstone's last field diaries is *The Last*

¹ <http://livingstone.library.ucla.edu/>

² <http://livingstone.library.ucla.edu/1871diary/>

³ http://livingstone.library.ucla.edu/livingstone_archive/

Journals of David Livingstone (1874), edited by Horace Waller after Livingstone's death.⁴ In creating this text, Waller's agenda was to portray his close friend Livingstone as a British national hero. To achieve this, Waller significantly edited, censored, and tampered with the data available in Livingstone's original manuscripts.⁵ As a result, the public has never had direct access to the text of Livingstone's unedited 1870 Field Diary -- an issue now further complicated by the fragile and partly illegible state of the original manuscript. The publication of our proposed edition would extend our efforts to resolve this problem and would help lay the groundwork for critically annotated editions of Livingstone's remaining final diaries, which are better preserved and do not require advanced imaging to enable analysis.

A.2. Significance of Livingstone's 1870 Field Diary and 1871 Letters. Many critics and historians regard David Livingstone as the most important British imperial travel writer of the nineteenth century. His manuscripts contain a range of otherwise unavailable data on pre-colonial Africa because of the breadth of his writings and experiences. His three visits to the African continent (1841-56, 1858-63, 1866-73) took him through territories that today constitute some ten different countries in Southern, Central, and East Africa. His writings represent an important -- yet underutilized -- resource for a variety of readers. These include general audiences with an interest in imperial history, African history, and the slave trade, as well as students and specialists of literary studies (Victorian literature, travel writing, postcolonial studies), history (Empire, colonialism, Africa, slavery & abolition, science, medicine, globalization), cultural studies, political science, the medical humanities, geography, and environmental studies.

The 1870 Field Diary and 1871 letters, in particular, present a dramatic story that will be of notable public and scholarly interest. Livingstone composed these manuscripts at the midpoint of his last journey to Africa (1866-73), but also at one of the lowest points of his career. Stranded in Central Africa, Livingstone had not had contact with the outside world for several years. He was depressed, isolated, and

⁴ David Livingstone, *The Last Journals of David Livingstone in Central Africa, from 1865 to His Death*, ed. Horace Waller (London: John Murray, 1874).

⁵ Dorothy Helly, *Livingstone's Legacy: Horace Waller and Victorian Mythmaking* (Athens, OH: Ohio University Press, 1987) details the complex manner in which Livingstone's final manuscripts were edited for publication.

surrounded by violent slave traders whom he despised but who nonetheless offered the only means of further travel into the African interior. He had developed an obsession that bordered on delusional with finding the mythical “source” of the Nile and with confirming geographical information in ancient authorities such as Herodotus and Ptolemy. He was also very ill, suffering alternately from pneumonia, fever, dysentery, heavy anal bleeding, and flesh-eating ulcers on his feet.

Yet Livingstone was also the first European to visit this part of Central Africa,⁶ and the 1870 diary and 1871 letters contain unique details of local African cultural, social, and economic practices, such as settlement and trading patterns, marriage rituals, religious ceremonies, dispute resolution methods, and political leadership strategies. The manuscripts record the impact of local diseases on Livingstone’s physical and mental health and outline the many treatments -- European and African -- that he applied. The manuscripts also paint a complex picture of the regional circulation of ivory as well as agricultural and manufactured goods. Most importantly, the diary and letters offer a detailed record of interactions between Africans and slave traders from Zanzibar, who had reached this part of Africa only recently. In detail, Livingstone describes the methods for capturing slaves, the treatment of slaves at the hands of their captors, and the use of guns to terrorize and manipulate Central African societies.

The opportunity to read the 1870 diary and 1871 letters in a critically-edited and annotated version will provide insight into all these elements, but also enable readers to study the strategic means by which Livingstone and others revised and transformed his words and experiences for a variety of audiences. Travel narratives, in particular, often went through multiple iterations between initial observations made in the field and final published popular and scientific texts. In revising the material of the 1870 Field Diary, for instance, Horace Waller elided Livingstone’s ambivalent dealings with slave traders, edited out references to the violence of Livingstone’s men, and removed criticism of British bureaucracy and politics. Waller also dramatized Livingstone’s physical suffering but omitted other medical details, such as Livingstone’s notes about the spread of STIs among Africans. Cumulatively, such

⁶ Livingstone wrote the 1870 and 1871 Field Diaries in Manyema, a region that today lies in the eastern part of the Democratic Republic of the Congo.

changes worked to sanitize Livingstone, simplify his experiences in the field, and transform a complex, multifaceted document into a much more ideologically directed text. Critically-edited and annotated access to the 1870 diary and 1871 letters will enrich our understanding of Livingstone's legacy as well as Victorian publishing practices and British strategies for promoting imperialism.

Finally, the material condition of Livingstone's 1870 Field Diary and 1871 letters -- like that of the 1871 Field Diary -- provides unique evidence of the circumstances of Victorian global exploration. Livingstone composed these manuscripts using locally-available inks in addition to those he packed, while the creases, water stains, and other elements of manuscript deterioration record the journey of the manuscripts from Africa to Britain *and* from the nineteenth century to the present day. However, unlike the 1871 Field Diary, which Livingstone wrote mainly on the sheets of a single issue of *The Standard* newspaper with improvised ink, the 1870 Field Diary and 1871 letters consist of a number of different paper types and contain a number of different inks. Additionally, despite the sequential numbering of a portion of the pages, the 1870 diary's composition history is far from certain. Preliminary examination of the manuscript suggests that Livingstone did not necessarily write all the numbered pages in order, for instance, and that he made additions to different pages at different times using different inks. The impact of adverse environmental conditions during composition and transportation further complicates analysis.

Consequently, the 1870 Field Diary and 1871 letters also offer an important opportunity to improve existing spectral image processing techniques and to develop new methods that reveal otherwise unobtainable data about the production and subsequent preservation history of the manuscript. Multispectral imaging or, more simply, spectral imaging involves illuminating a cultural object by bands of light in sequence across the visible and invisible spectra, photographing the illuminations with a high-resolution digital camera, and digitally processing the resulting images. Our use of this technology to restore and study Livingstone's 1871 Field Diary resulted in a near complete recovery of the text, enabled us to identify and describe a range of unusual manuscript features that could not be seen or studied with standard natural light images, and captured the interest of general audiences and scholars alike. Work for the proposed edition will allow us to break new ground in applying this technology for the study of

Livingstone's manuscripts, and the development of spectral imaging techniques tailored to the 1870 Field Diary and 1871 letters will be of significant value for our analysis and annotation of these manuscripts.⁷

A.3. Nature of the Edition: Our proposed edition -- a multispectral critical edition of Livingstone's 1870 Field Diary and select 1871 letters -- will be developed over a two-year period (Dec. 2013-Nov. 2015).

The edition will provide:

- critically edited and annotated access to the diary -- which has never been published in its unredacted form -- along with facsimile images of the manuscript as it appears today in natural light and, for comparison, the text of the posthumously published version of the diary (1874);
- critically edited and annotated access to the 1871 letters, two of which have not been previously published, along with facsimile images of the letters as they appear today in natural light.
Although written concurrently with the 1870 and 1871 Field Diaries, the letters are directed to family and professional contacts and so offer a different perspective from the private diaries;
- processed spectral images of the 1870 Field Diary and 1871 letters. The processed spectral images will enhance illegible portions of Livingstone's text, reveal manuscript topography, highlight environmental traces on the manuscript pages, and differentiate the inks used by Livingstone and others in correcting and marking up the text. These features tell their own story about the construction and history of the manuscripts;
- bibliographic essays that draw on close analysis of both processed spectral images and the material condition of the manuscripts to examine and describe in detail the structure of the diary, Livingstone's composition methods, and the diary's material history;
- biographical, cultural, and historical essays that locate the diary and letters in the context of Livingstone's life, the African societies among whom he composed the diary, and the broader historical circumstance of nineteenth-century exploration and imperialism.

⁷ The techniques may also be of use to future spectral imaging projects that focus on manuscripts and printed texts that were developed in stages and/or annotated by different hands.

The proposed edition will also include a detailed project history with text, photographs, and downloadable internal project documents that makes transparent the process by which the critical edition was produced and that will allow scholars and other interested individuals to build on and learn from our work. Finally, all core image and text files upon which the edition is based will also be released separately as “flat files” that do not depend on a specific graphical user interface (GUI) and that will be available for direct download through the *Livingstone Spectral Image Archive*. This publication strategy will allow scholars to use and build on our data independently of the critical edition in which the data will also be embedded.

The 1870 diary and 1871 letters pose unique challenges to legibility and historical preservation -- challenges integral to the place of these texts in imperial history. Spectral image processing offers the necessary capability for detailed analysis because it can both increase legibility and highlight the physical details of the manuscript: different layers of handwritten and printed text, the warping topography of the page, environmental traces on the page surface, and the characteristics of the various papers and inks used by Livingstone. Analysis of such details will enrich our understanding of the history of these manuscripts. This history extends from Livingstone's use of local plants to make his ink, to the international circulation of the British newspapers he used to write the diary, to the environmental conditions in which his manuscripts were created and transported. Although scientists have previously applied spectral imaging to restore erased writing in medieval palimpsests and other historical documents, most notably the Archimedes Palimpsest,⁸ our project is among the first -- if not *the* first -- to use such technology for the digital preservation, restoration, and analysis of nineteenth-century British manuscripts.

B. History and Duration of the Project

B.1. Preliminary Research and Preparation: In 2009, Dr. Adrian S. Wisnicki, the PI of the proposed edition, visited the David Livingstone Centre in Blantyre, Scotland with the goal of consulting Livingstone's 1871 Field Diary. Wisnicki was researching his book project, *Fieldwork of Empire: Intercultural Dynamics in the Production of Victorian Colonial Literature*, a critical study of Victorian

⁸ <http://archimedespalimpsest.org/>

travel and exploration literature centered on Africa. When Wisnicki, with the help of archivist Anne Martin, examined the pages of the 1871 Field Diary, he discovered that the majority of them could not be read under natural light because the ink had faded and only the underlying newsprint remained legible.

To read the diary, Wisnicki soon partnered with the Archimedes Palimpsest imaging team. This team, highly regarded for a series of prior spectral imaging projects, took interest in Livingstone's 1871 Field Diary because the diary offered challenges not previously encountered by the team. The Archimedes team in collaboration with Wisnicki submitted an application for an NEH Digital Humanities Start-Up Grant (\$50,000) in the fall of 2009. An additional application to the British Academy Small Research Grant (£7,125, approx. \$11,330) submitted by Wisnicki's British colleague, Debbie Harrison, sought funds to supplement the NEH application. Both applications were successful and provided funding for a critical edition of the 1871 Field Diary and the *Livingstone Spectral Image Archive*.

B.2. Collection of Materials and Initial Publication: In June 2010, Wisnicki, Harrison, and representatives of the Archimedes team spectrally imaged Livingstone's 1871 Field Diary at the National Library of Scotland (NLS) in Edinburgh, where the diary had been transported from the David Livingstone Centre. The team used equipment brought from the United States and facilities provided by the NLS to collect all the "raw" spectral image with a state-of-the-art image capture system produced by Megavision, Inc. (now Transcendent Imaging, Inc.) that maximizes the information recorded with minimum impact on the historical documents.⁹ Through this system, manuscript pages are illuminated by narrow bands of wavelengths of light (with bandwidths $\delta\lambda$ of the order of 20-40nm) ranging from the ultraviolet through the visible to the near infrared, each band generated by light-emitting diodes (LEDs). A primary advantage of this system is that LEDs do not generate heat that can damage the fragile pages. The June 2010 sessions resulted in full imaging of the 1871 Field Diary plus -- when the team ran ahead of schedule -- full imaging of the 1870 Field Diary and the five contemporaneous letters.

⁹ See http://livingstone.library.ucla.edu/1871diary/spectral_imaging1.htm for additional detail on the spectral imaging system.

Over the next 18 months, the project team worked to convert the raw 1871 Field Diary spectral image data into processed images that made Livingstone's text legible for the first time since the nineteenth century, to transcribe and encode the text into XML TEI P5, and to build a robust critical edition that gave access to all the processed spectral images of the 1871 Field Diary, provided detailed contextual and bibliographical essays, and included a comprehensive project history containing some 65 downloadable documents that offered an intimate look into the inner workings of the project. Once all scholarly and scientific research was complete, the team partnered with the UCLA Digital Library to publish *Livingstone's 1871 Field Diary: A Multispectral Critical Edition*¹⁰ in a beta edition on 1 November 2011 and in a formal first edition on 26 April 2012. In addition, the team concurrently released all the project's core primary data as the *Livingstone Spectral Image Archive*,¹¹ a database created to international library standards containing TIFF images, XML transcriptions, and metadata as well as an array of supporting documents.

These publications, grouped together as the Livingstone Spectral Imaging Project,¹² have subsequently received positive peer-reviews and have been accepted for inclusion in NINES,¹³ the leading digital resource aggregator for nineteenth-century scholarship. The publication of the project results in November 2011 drew worldwide media attention, including coverage by the Associated Press, *The New York Times*, *The Washington Post*, and *BBC News*.¹⁴ In fact, as of February 2012, the Livingstone project had more media coverage entries than any other grant-funded project on the NEH website. The project also inspired a variety of individuals to contact the project team -- from teachers and interested members of the public, to British museum and library curators, to scholars and graduate students. Likewise, Megan Ward, a Victorianist and co-PI on the proposed edition, read about the project on the NEH website, reached out to the team, and has subsequently been invited to join the project.

¹⁰ <http://livingstone.library.ucla.edu/1871diary/>

¹¹ http://livingstone.library.ucla.edu/livingstone_archive/

¹² <http://livingstone.library.ucla.edu/>

¹³ www.nines.org/

¹⁴ A full list of press coverage can be downloaded here: http://livingstone.library.ucla.edu/1871diary/documents/07_Press_Coverage_Livingstone_Spectral_Imaging_Project.pdf

B.3. Results of Prior NEH-funded Project: The first formal phase of the Livingstone Spectral Imaging Project, funded by an NEH Digital Humanities Start-Up Grant (2010-11), met in full or exceeded the vast majority of the principal and ancillary goals stated in the grant application, as briefly indicated below.¹⁵

Principal Goals (taken from the NEH grant application)	Status
Build on previous spectral imaging of medieval palimpsests to devise and implement new processes and technologies to spectrally image Livingstone's 1871 Field Diary.	Completed in full.
Process the resulting image data with open source software in order to recover the faint, often illegible text of the diary.	Completed. Approximately 99% of Livingstone's text recovered.
Produce an online critical edition and image database so that Livingstone's unredacted diary is accessible to scholars for the first time.	Completed in full through the critical edition of 1871 Field Diary and the <i>Livingstone Spectral Image Archive</i> .
Produce marked up transcriptions and processed images.	Completed in full.
Extend the use of the spectral imaging from medieval palimpsests to faded nineteenth-century paper manuscripts.	Completed in full.
Challenge scientific participants to identify optimal imaging techniques for a nineteenth century paper manuscript.	Completed in full.
Educate scholars of the nineteenth century on the potential of the new technology for their field.	Completed in full for scholars on project. Lectures, conference, publications continue process in academic community.
Explore new frontiers for cross-disciplinary collaboration in the technical processing and scholarly study of digitized cultural objects.	Completed for project, but also ongoing. Current grant application continues this initiative.
Data marked up with all metadata needed for retrieval, scholarly and scientific analysis, <i>and</i> interoperability with related projects.	Completed, except development of RDF metadata for project inclusion in NINES is still in-progress.
Experience gained from the project will guide the production of a dynamic, online critical edition of all of Livingstone's final African exploration diaries.	Ongoing. Current grant application continues this initiative.
Experience gained from the project will provide a model for collaboration between imaging scientists and humanities scholars to produce comprehensive digital editions of literary manuscripts that treat such manuscripts as both texts <i>and</i> material and cultural objects.	Completed in full through critical edition, including 1) contextual and bibliographical essays, and 2) detailed project history with text, images, and documents for download.

However, a number of unforeseen challenges compelled nearly all team members to provide significant, uncompensated time and effort for these goals to be realized.¹⁶ These challenges coupled with scope

¹⁵ Our project white paper, which is available as a PDF download directly from the NEH (<https://securegrants.neh.gov/publicquery/main.aspx?f=1&gn=HD-51042-10>), includes a "compliance matrix" that details all project goals and accomplishments. The matrix appears on pages 26 to 33 of the PDF file.

limitations also prevented our team from developing tailored processing techniques, transcribing/encoding, or critically analyzing and annotating the 1870 Field Diary and 1871 letter spectral data -- other than transcribing/encoding the eight folia of the 1871 letters and including the 1870 diary and 1871 letters in bulk image processing and data management tasks focused on the 1871 Field Diary.

The proposed project will thus build on our previous efforts, but focus on a wholly new set of activities centered on scholarly study of the 1870 Field Diary and 1871 letters. The funding requested will allow us to run a robust and comprehensive project that provides appropriate compensation for the time and effort to be expended by all team members and that accounts for the additional length of the 1870 field diary as well as the additional processing challenges posed by both the 1870 diary and 1871 letters. As fully detailed below, the new activities will include new spectral image processing of the already collected raw data to reveal the unique characteristics of the 1870 Field Diary and 1871 letters, transcription/encoding of the 1870 Field Diary, critical analysis and annotation of the diary and letters, development of a suitable interface, full project documentation, and dissemination. The proposed activities will form the final phase of the Livingstone Spectral Imaging Project, which began with *Livingstone's Letter from Bambarre* (UCLA Digital Library, 2010-11),¹⁷ a pilot project on a single, privately-owned letter from 1871 and then continued with the two previous, NEH-funded publications.

B.4. Scope of the Proposed Edition, Selection Criteria, Organization: Our proposed edition will include processed images and transcriptions of the surviving folia of Livingstone's 1870 Field Diary and the five 1871 letters in order to offer users as definitive versions of the texts as is possible. As described above, we have already captured the needed raw spectral data. We have decided to publish these texts because these materials are linked by period, content, and composition methods, and, together, the 1870 Field Diary and 1871 letters demonstrate the full range of Livingstone's audiences. Livingstone writes for

¹⁶ As noted in the project history of the 1871 Field Diary, NEH and British Academy funds proved inadequate for realizing the full objectives of the NEH-funded project (2010-11) and "every funded project member providing significant work for the project out of scope," while "[u]nfunded team members, in turn, uniformly assisted on a pro bono basis" (see http://livingstone.library.ucla.edu/1871diary/lessons_future_projects.htm).

¹⁷ <http://livingstone.library.ucla.edu/bambarre/>

himself, for family, and for professional contacts, but at the same time, he writes for a worldwide audience interested in the slave trade, imperial politics, and Christian missions. Publishing the diary and the letters together will demonstrate how these audiences overlap, often within the same diary entry or letter. Moreover, critically-mediated access to these manuscripts will broaden our understanding of Victorian strategies for editing and publishing texts from Livingstone's final travels.

The 1870 Field Diary¹⁸ consists of 74 leaves or 148 individual folia (one leaf, recto and verso = two folia). These folia contain 94 individually numbered pages (numbered consecutively from 1 to 101 -- a few of the pages have not survived) plus 70 unnumbered pages. The diary is held by the National Library of Scotland (NLS) in Edinburgh and the David Livingstone Centre (DLC) near Glasgow, with an additional fragment held by the British Library (BL) in London. The diary is organized as follows:

Inst.	Shelfmark	Date	Numbers	Description of Folia
DLC	297a	17 Aug. 1870	none	70 individual folia. The folia have been cut from the top page margins of an unidentified printed book and assembled into a small booklet.
BL	Add.MS.50184	18-24 Aug. 1870	I-IV	Two folia containing four pages, written over an old letter.
NLS	MS.10703	10 Oct. 1870	X-XIII	Four folia containing four pages, written over the pages of an unidentified printed book.
DLC	297b	13 Oct. 1870	XIV	Two folia containing one page, written over the page of an unidentified printed book.
DLC	297d	19 Oct.- 2 Nov. 1870	XVII-XX	Two folia containing four pages, written on the back of a large map.
NLS	MS.10703	3 Nov.- 15 Nov. 1870	XXI-LXI	42 folia containing 42 pages of the diary (page number LV is repeated), written over the pages of an unidentified printed book.
DLC	297e	22 Nov.- 10 Dec. 1870	LXII-LXIX	Four folia containing eight pages of the diary, written over the pages of an unidentified printed book.
NLS	10703	12-23 Dec. 1870	LXX-LXXV	Six folia containing six pages, written over the pages of an unidentified printed book.
DLC	297b	16 Jan. 1871	LXXVI	Two folia containing one page, written over the page of an unidentified printed book.
NLS	10703	24 Jan.- 19 Feb. 1871	LXXVIII-LXXXVII	Ten folia containing ten pages, written over the pages of an unidentified printed book.
NLS	10703	21 Feb.-22 Mar. 1871	LXXXVIII-CI	Four folia containing 14 pages, written over the pages of the <i>Pall Mall Budget</i> .

¹⁸ Livingstone's 1870 Field Diary, which spans 17 August 1870 to 22 March 1871, has received its present title primarily to differentiate it from the 1871 Field Diary (23 March - 3 November 1871) already published by the Livingstone Spectral Imaging Project.

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As noted, not all the original numbered pages of the 1870 Field Diary have survived. However, there does exist a nineteenth-century transcription of the entire diary by Livingstone's daughter Agnes Livingstone. This transcription does not reflect modern editing standards, but does offer the possibility of recovering a version of the text for the eight 1870 Field Diary pages that are no longer extant. This transcription is held by the Rhodes House Library, Oxford University under the shelfmark MS.Afr.s.16.6. As part of the work for the proposed edition, we will review the relevant portions of this transcription and attempt to reconstruct the missing text. As a result, our proposed edition will offer the most complete version possible of Livingstone's text by drawing on all surviving original and secondary versions.

The five 1871 letters to be included in the proposed edition consist of eight folia in total:

Inst.	Shelfmark	Date	Recipient	Description of Folia
NLS	MS.10701	13 Feb. 1871	John Kirk	Two folia, written over a page taken from a proof copy of the <i>Proceedings of the Royal Geographical Society</i> .
NLS	MS.10707	Mar. 1871	Agnes Livingstone	Two folia, written over a page taken from a proof copy of the <i>Proceedings of the Royal Geographical Society</i> .
NLS	MS.10768	25 Mar. 1871	John Kirk	Two folia, written over a page taken from a proof copy of the <i>Proceedings of the Royal Geographical Society</i> .
NLS	MS.10768	14 May 1871	John Kirk	One folio, written on the recto of a sheet of paper used by Kirk to wrap quinine sent to Livingstone.
NLS	MS.10768	26 June 1871	John Kirk	One folio, written on the verso of a sheet of paper used by Kirk to wrap quinine sent to Livingstone.

The proposed edition will make available materials that are currently dispersed across multiple libraries, building on the process of manuscript reintegration begun through the creation of the *Livingstone Spectral Image Archive* and the critical edition of Livingstone's 1871 Field Diary. Our decision to produce an electronic edition rather than a print edition will allow us to include functionalities that are only possible online such as searching and sorting the encoded text data, interlinking our project with other digital projects through the use of metadata, and studying natural light and processed spectral images simultaneously in a synchronized fashion. All these functionalities will be important to users of the diary and will also facilitate our own analysis and annotation of the text.

Through the previous phase of our project, we have already secured permission from the relevant copyright holders to publish a critical edition and image database of the above materials through the

Creative Commons Attribution-Noncommercial License, which allows full public access and use of our edition for research and study purposes with attribution, but not for commercial use. The only exceptions to this rule are the two BL folia, for which copyright will be retained by the British Library Board, and the nineteenth-century transcription of the 1870 Field Diary by Agnes Livingstone, which will be published by permission of the Bodleian Library, University of Oxford.

C. Methods

C.1. Analysis, Transcription, Verification, and Presentation of the Texts: Final online publication of the 1870 Field Diary and 1871 letters will involve a number of integrated, often concurrent activities.

Initially, scholars Wisnicki and Ward will conduct an examination of the natural light and previously produced, bulk-processed spectral images of the manuscript to identify 1) manuscript segments that most require spectral image processing to clarify the text, 2) sample folia that include the presence of visually distinct inks, 3) folia with regions of obvious topographical interest, and 4) manuscript elements (for instance, water damage, page discoloration) suitable for study through spectral image processing. The scholars will then review these regions and elements of interest with imaging scientists Knox and Easton and develop a prioritized list of spectral image processing tasks.

Processing of the raw 1870 Field Diary and 1871 letter spectral image data will depend on refining techniques developed during the Archimedes Palimpsest project, the Livingstone Spectral Imaging Project, and other projects as well as supplementing those with new techniques tailored to the peculiarities of Livingstone's 1870 Field Diary and 1871 letters. As in the previous project phase, the scientists will render 1) pseudocolor images, which combine optimum raw images to create false color images that enhance features of interest, and 2) images created by principal component analysis (PCA), which maximizes the data variance in the images to enhance contrast between principal components. The workflow will be iterative: as each scientist produces a new set of images, the scholars will review results and provide feedback. Once image processing is complete, imaging logs will be integrated with required metadata to generate complete records for the new processed images.

As the processing advances, Wisnicki and Ward will begin to transcribe, encode, and annotate Livingstone's original manuscripts and the text of the posthumously published 1874 version of the diary in XML TEI P5.¹⁹ Transcriptions will be in diplomatic format with three levels of textual production recorded: original text written by Livingstone, corrections made by Livingstone, and corrections made by present editorial team. TEI encoding practices will follow those previously established for the Livingstone Spectral Imaging Project²⁰ and will highlight both content elements (for instance, people, African tribes, places, geographical entities, dates, figures) and structural and material features of the manuscript. The scholars will submit particularly difficult encoding issues to Cummings for review and resolution. Annotation will describe textual peculiarities, but also lay the groundwork for the edition's critical essays. The scholars will ensure quality by producing, encoding, and annotating transcriptions in three stages prior to online release: 1) initial transcription, TEI encoding, and annotation performed by a single individual (Wisnicki or Ward), 2) review of transcription, TEI encoding, and annotation performed by a second individual (Wisnicki or Ward), and 3) additional sample review of encoding by Cummings and/or McAulay. After online beta release, a fourth stage of proofreading will be done by Wisnicki and/or Ward.

The project team will integrate all new processed images and transcriptions into the *Livingstone Spectral Image Archive* and use these images and transcriptions as the basis for the critical edition of the 1870 Field Diary and 1871 letters. The critical edition, in turn, will emulate and enhance presentation strategies previously established for the critical edition of the 1871 Field Diary, and will focus on offering users multiple means of access to Livingstone's text. Specifically, users will be able to:

- 1) read the transcription of the 1870 Field Diary and 1871 letters alongside processed spectral images;
- 2) examine natural light and processed spectral images simultaneously with the options of
synchronized scrolling and compressed JPEG download;

¹⁹ We do not plan to transcribe the intermediate version of the text found in Livingstone's "Unyanyembe Journal" (1866-72) through the proposed edition because we have plans to do so through another project that is currently under consideration for an NEH Humanities Collections and Reference Resources Grant: "The *Livingstone Online* Enrichment and Access Project" (submitted 19 July 2012). Should this grant be unsuccessful, Wisnicki and Ward will transcribe the Journal for the proposed edition on a pro bono basis.

²⁰ http://livingstone.library.ucla.edu/1871diary/xml_coding.htm

- 3) engage in parallel study of the 1870 Field Diary and relevant portion of the 1874 published edition;
- 4) search and sort the text of the 1870 Field Diary and 1871 letters by keyword or TEI tagged content;
- 5) download PDF versions of the 1870 Field Diary and 1871 letters as originally written and corrected by Livingstone *and* as amended by the project team; and
- 6) download all original high-resolution TIFF and XML files upon which the edition is based directly for the *Livingstone Spectral Image Archive*.

Additionally, manuscript annotations embedded in the XML files, a keyword glossary (people, tribes, places, geographical entities), and historical, cultural, biographical, and bibliographical essays will add a rich and complex contextual dimension to the presentation of the texts.

C.2. Editorial Principles and Objectives: Our principal goal in restoring, transcribing, annotating, and publishing Livingstone's 1870 Field Diary and 1871 letters is to produce electronic texts that are as faithful as possible to the original manuscripts (including all of Livingstone's corrections), and so that will serve the needs of scholars and students. However, a simultaneous goal is to present the texts in a manner that is clear, highly readable, and accessible to general audiences. In the critical edition, readers will be able to study two versions of the text: 1) as originally written and corrected by Livingstone, and 2) as further amended by the present editorial team. In other words, users will have access to a "diplomatic" version of the text that presents the text as a historical object with all its flaws and idiosyncrasies intact *and* to a "critical" version that provides an ideal, corrected version of the text. Scholars who wish to study in detail our editorial choices and observations will also have direct access to our XML files and a detailed enumeration of all our encoding decisions and practices.

The basis for the proposed edition will be a transcription of Livingstone's manuscripts into XML TEI P5,²¹ one of the most widely supported standards for the electronic transcription of texts. The use of this format will enable us to represent digitally Livingstone's texts with a high degree of granularity. We will transcribe all text that is legible, including text only legible through spectral image processing. We

²¹ <http://www.tei-c.org/Guidelines/P5/index.xml>

will record all instances of text that has been added or deleted from the manuscript by Livingstone and others -- a process assisted by the use of processed images that differentiate inks on a given page. We will also note with degree of editorial certainty any ambiguous, unclear, or wholly illegible text. Additionally, TEI P5 encoding will allow us to record manuscript peculiarities, unusual spacing, and gaps in the text such as those due to manuscript damage as well as any editorial corrections or other interventions -- although our goal is to keep such editorial interventions to a minimum.

The broad public interest generated by the previous phase of our project coupled with the range of activities organized for the upcoming 2013 Livingstone bicentenary²² testify to the continuing, international interest in Livingstone and underscore our need to make his works accessible to as wide a readership as possible. To this end, we will provide historical, cultural, biographical, and bibliographical essays directed to both scholars and non-academic audiences, as per previous project practice. These essays will draw on the multidisciplinary expertise of the project team scholars, which embraces Victorian colonial literature, geography, science, technology, material culture, and book history as well as African colonial history and culture and British imperial history and biography. The essays will:

- place the 1870 Field Diary and 1871 letters within the broader contexts of Victorian British exploration and imperialism, and Livingstone's own life and travels in Africa;
- discuss the local nineteenth-century Central African contexts in which Livingstone wrote his diary and letters, including the context of Zanzibar's East African trading empire;
- examine the differences between original field diary and the published 1874 version and analyze Horace Waller's objectives in revising the original text; and
- outline the complex history of the manuscripts from the nineteenth century to the present day.

Where relevant, these essays will include images, illustrations, and Victorian maps that add a significant visual dimension to our analysis and that will be of particular assistance to non-academic audiences. The essays will also set out the textual discoveries made through spectral image processing as a way of

²² <http://www.davidlivingstone200.org/index.php>

discussing how Livingstone produced the manuscripts and the impact of environment on the material condition of the manuscripts. Essays on Livingstone's composition methods and manuscript structure will expand on the observations noted in the XML coding and examine topics such as Livingstone's inks, paper, orthography, hand-drawn illustrations and maps, and use of foreign text. Finally, our proposed edition will contain an overview of the types and objectives of the processed images produced during the grant period; a glossary of key terms, people, African tribes, places, and geographical entities referenced in the 1870 Field Diary and 1871 letters; and a multidisciplinary bibliography directed to users who wish to carry out further research on the manuscript.

As before, attention to the MLA "Guidelines for Editors of Scholarly Editions"²³ will inform the apparatus development. These guidelines have helped us establish the abstract principles that underpin our transcription practices, editorial objectives, interest in methodological transparency, and production of annotations and contextual materials. The MLA's "Guiding Questions for Vettors of Scholarly Editions"²⁴ have also helped us ensure that our edition, apparatus, and contextual materials are as comprehensive as possible -- a point commended by reviewers for NINES of the previous project phase.

C.3. Data Management Plan: The foundational work for our proposed edition will result in:

- 1) new processed TIFF spectral image files with full metadata embedded in the header;
- 2) separate TXT files containing image metadata;
- 3) XML TEI P5 transcriptions files that correspond to each of the 1870 Field Diary folia; and
- 4) MD5 checksum files to ensure image and transcription file fixity.

Data will be validated and verified before delivery. For all folia, we will create uncompressed TIFF images of at least 300dpi for archival purposes. For access in the proposed edition, we will also create derivative full-resolution JPEG2000 images for zooming and panning and compressed JPEG web images

²³ http://www.mla.org/cse_guidelines

²⁴ http://www.mla.org/cse_guidelines_2011

at 1800 pixels on their longest edge. TIFF images will conform to version 6.0 of the TIFF specification.

JPEG2000 and JPEG images will also comply with current standards for those file types.

All these files, excepting the JPEG files, will then be integrated into the *Livingstone Spectral Image Archive* and stored as “flat files” that are not dependent on any specific graphical user interface (GUI) so as to ensure long-term viability. The archive already contains the raw spectral data for the 1870 Field Diary and 1871 letters distributed into a series of institutional directories and folio sub-directories. The relevant sub-directories each correspond to one imaged folia and currently contain:

- 1) all raw TIFF spectral image files collected in June 2010 with full metadata in the file headers;
- 2) all processed TIFF spectral image files with full metadata in the file headers, as produced by automating bulk processing techniques developed for the 1871 Field Diary;
- 3) separate TXT files containing image metadata;
- 4) XML TEI P5 transcriptions files that correspond to each of the 1871 letter folia; and
- 4) MD5 checksum files to ensure image file fixity.

Because of the symmetry between data to be collected and already collected, we anticipate that the integration of the new and old data sets in the *Livingstone Spectral Image Archive* will be straightforward.

The *Livingstone Spectral Image Archive* itself is based on the proven archive and metadata model and standards used for the Archimedes Palimpsest and other spectral imaging projects. This archive model is designed to be self-documenting for human and automated access, and it provides data and metadata in a regular and predictable structure. The archive design is based on principles set out by the Open Archival Information System (OAIS). The archive also includes supplemental material such as guides for data set use and details of cataloging and transcription methods. For all digitized objects, we will provide descriptive metadata adhering to the MODS standard, and mapped to Dublin Core for metadata harvesting purposes.²⁵ Metadata will be not limited to identification of the images but will also include information about the imaging parameters for each of the processed images. Our team will also

²⁵ The UCLA Digital Library usually populates the following elements in MODS as a minimal record: titleInfo.title, identifier, name (to record a creator and the holding repository), originInfo.date.dateCreated, language, typeOfResource, physicalDescription, and accessCondition.

record structural metadata, along with camera and lighting specifications, the algorithms used to process images, and software information. Finally, the *Livingstone Spectral Imaging Project* as a whole has already been accepted by the aggregator site NINES for inclusion. NINES uses RDF metadata for resource discovery, so we will also create RDF for the proposed edition.

D. Work Plan

D.1. Activities: Work for our proposed edition will last two years (December 2013 - November 2015).

Overall project planning and management will be conducted by Wisnicki (PI) and Ward (co-PI) in collaboration with McAulay (UCLA lead). Documentation and dissemination will be ongoing. For communication, the team will use in-person meetings, teleconferences, and networked communications.

Dec. 2013 - May 2014: image processing, text transcription, apparatus development

- develop detailed project plan and integrated schedule (project team)
- examine color and previously produced processed spectral images to identify regions/elements of interest for new processing (Wisnicki, Ward)
- review of regions and elements of interest to develop prioritized spectral image processing task list (Wisnicki, Ward, Knox, Easton)
- commence processing raw spectral images (Knox, Easton, with Wisnicki, Ward)
- transcribe/encode/annotate first third of 1870 Field Diary (Wisnicki, Ward, with Cummings, McAulay)

June 2014 - Nov. 2014: image processing, text transcription, apparatus development, travel

- conclude processing spectral images (Knox, Easton, with Wisnicki, Ward)
- integrate imaging logs with metadata to generate records for new processed images; integrate images into *Livingstone Spectral Image Archive* (Emery, McAulay, with Knox, Easton)

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- transcribe/encode/annotate second third of 1870 Field Diary into XML TEI P5 (Wisnicki, Ward, with Cummings, McAulay)
- research/write essays on composition methods, manuscript structure, and spectral image processing (Wisnicki, Ward, with Knox, Easton)
- travel to Scotland to research historical, cultural, biographical, and bibliographical essays; meet with Scottish stakeholders to review progress (Wisnicki, Ward)

Dec. 2014 - May 2015: text transcription, apparatus/interface development, travel

- travel to Los Angeles to plan interface development with UCLA staff; deliver lecture to UCLA faculty and students on the proposed edition (Wisnicki, Ward)
- transcribe/encode/annotate last third of 1870 Field Diary (Wisnicki, Ward, with Cummings, McAulay)
- write cultural and biographical essays; develop glossary of key terms (Wisnicki, Ward)
- acquire digital copies of images, illustrations, and maps needed for apparatus (Wisnicki, Ward)
- commence electronic edition interface development (Ghorpade, McAulay, Wisnicki, Ward)

June 2015 - Nov. 2015: text transcription, apparatus/interface development, dissemination, travel

- transcribe/encode portions of A. Livingstone transcription; encode portions of Livingstone's *Last Journals* (1874) (Wisnicki, Ward, with Cummings, McAulay)
- integrate all transcriptions into *Livingstone Spectral Image Archive* (Emery, McAulay)
- write historical and bibliographical essays; create bibliography; assemble/write project history (Wisnicki, Ward, with project team for last item)
- conclude electronic edition interface development (Ghorpade, McAulay, Wisnicki, Ward)
- public release of full project results; distribute press releases/academic announcements; solicit formal reviews of completed edition from scholarly journals (project team)

- travel to UK to review project results with stakeholders; deliver public lectures at stakeholder institutions: NLS, DLC, Oxford, BL (Wisnicki, Easton, McAulay)

D.2. Deliverables

- 1) Complete, interoperable electronic edition of Livingstone's 1870 Field Diary and select 1871 letters that reflects the scholarly, scientific, archival, and documentation standards established by the NEH-funded electronic edition of Livingstone's 1871 Field Diary.
- 2) All proposed edition underlying TIFF images, XML transcriptions, and metadata provided separately as "flat" files and integrated into the *Livingstone Spectral Image Archive*.

E. Final Product and Dissemination

E.1. Hosting and Sustainability: All digital assets and services developed during the grant period will, in keeping with project practice, be published and hosted by the UCLA Library and integrated into UCLA Library's data management and preservation standard practice. UCLA Library is committed to the long-term accessibility and preservation of digital assets and currently has a digital preservation strategy that involves unique identifiers (ARKs) and replicated storage at two data centers (Los Angeles and Berkeley). The assets are maintained on RAID storage with regular back up both nightly (incremental) and every sixty days (full). The full backups are stored permanently offsite. The UCLA Library will continue to preserve and migrate the David Livingstone digital assets into new repositories and digital preservation systems over time to ensure their viability.

Locally all Livingstone digital objects produced for the proposed edition (images, transcriptions, metadata, etc.) will be hosted by the UCLA Library's Islandora instance. The Islandora digital library framework consists of Fedora, a digital asset management system particularly well-suited for digital library content and widely used in the cultural heritage community, and Drupal, a content management system used as the back-end for at least 1.5% of all websites worldwide. Standardization on Fedora for the repository layer and Drupal for the discovery layer allows us to leverage open-source activity in these

open source communities, which in turn enhances the ability of the UCLA Library to provide sustainable services in the long term. UCLA Library is currently working with the Islandora development team to unite the Merritt repository with the Islandora framework in order to integrate Merritt-based preservation services more directly into the digital object ingest and publication workflow. We anticipate that this Merritt integration will have been achieved by the conclusion of the grant period and that all Livingstone digital content will be deposited with Merritt for preservation purposes.

All the digital content created for the proposed edition will conform to UCLA Library standards and appropriate national and international standards. From that point forward, digital content will be sustained and further developed, consistent with the Library's mission to provide access to first class collections -- both physical and digital -- that support high-level research and instruction. Additionally, all digital content will become a permanent part of the UCLA Digital Library collections. Finally, the use of open international standards in metadata, images, and transcription data files will help to ensure that the future process of forward migration is simplified through the provision of machine-processable metadata. That all data will also be made freely available for download under an open Creative Commons license aids long-term preservation and will encourage the dissemination of multiple copies of the material.

E.2. Dissemination: The results of our spectral imaging project have drawn sustained, worldwide media coverage from 2010 to 2012 and have helped launched a range of new initiatives, including the creation of a script and dramatic staging of the 1871 Field Diary by Jeannie Marie-Brown in collaboration with Wisnicki,²⁶ as well as invitations for the project to feature as part of Livingstone 2013 bicentenary exhibits at the National Museum of Scotland, the National Library of Scotland, and the David Livingstone Centre, Scotland. As a result, dissemination of the proposed edition will follow the highly successful, international dissemination model already established by our project.²⁷ We will target both scholars and the general public through press releases and academic announcements. We will reach out personally to

²⁶ http://www.iup.edu/newsItem.aspx?id=136341&blogid=3213&utm_campaign=iup_daily&utm_medium=e-mail&utm_source=iup_daily&utm_content=2012-11-14

²⁷ See http://livingstone.library.ucla.edu/1871diary/analysis_dissemination.htm for a discussion of this model.

journalists with whom we have previously collaborated. We will also give conference presentations and public lectures. To mark project milestones, we will directly contact specialists interested in our work and distribute academic announcements to listservs such as Victoria, Humanist, H-Africa, H-Slavery, H-Travel, TEI-L, Sharp-L, and DLF-Announce. Finally, as the proposed project matures, we will solicit formal reviews of the completed edition from a multidisciplinary range of journals such as *Digital Humanities Quarterly*, *Journal of Victorian Culture*, and *African Research & Documentation*.

F. Staff

Cummings, James. Senior Digital Research Specialist, IT Services, University of Oxford. Specialist on text encoding and markup languages. Chair of the TEI Technical Council. Project duties: Advise on and review samples of TEI P5 encoding of Livingstone manuscripts. Time commitment: 32 hours.

Easton, Roger L., Jr. Professor, Chester F. Carlson Center for Imaging Science, Rochester Institute of Technology. Extensive experience in the use of modern imaging and image processing technologies for recovering text from manuscripts, including faded and erased texts, palimpsests with overwritten text, water-damaged leaves, and damaged wax seals. Project duties: Develop and apply specialized image processing algorithms, including principal component analysis (PCA), to enhance Livingstone's texts. Time commitment: 208 hours.

Emery, Doug. Data Manager, Emery IT. Experience includes the Archimedes Palimpsest Project, Syriac Palimpsest Project, Sinai Palimpsests Project, and Livingstone Spectral Imaging Project as well as the Walters Art Museum's several NEH-funded manuscript imaging projects. Project duties: Integrate new processed images, XML files, and metadata into *Livingstone Spectral Image Archive*, deliver collected data to UCLA. Time commitment: 80 hours.

Ghorpade, Parinita. Project Programmer, UCLA Digital Library. Programmer/Analyst III responsible for digital library development, especially XSLT, Java, and Solr programming. Has done all the programming to support the Livingstone Spectral Imaging Project to date. Project duties: All programming and UCLA data management for the project. Time commitment: 15% FTE/1 year.

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Knox, Keith. Independent Imaging Scientist, Hawaii. Internationally-recognized researcher in image processing with a focus on extracting information from noisy data. 35 years experience in processing digital images for scanners, printers, astronomical analysis, and historical manuscripts. Project duties: Develop specialized image processing algorithms to enhance Livingstone's texts; investigate spectral variations in ink and paper, and develop algorithms to discriminate between different inks and to analyze environmental damage to the written documents. Time commitment: 208 hours.

McAulay, Lisa. Librarian, UCLA Digital Library Program. Oversees the development and execution of digital projects, including St. Gall Monastery Virtual Library, UCLA Encyclopedia of Egyptology, and Livingstone Spectral Imaging Project. Project duties: Review TEI encoding; coordinate activities of the Project Programmer. Time commitment: 5% FTE/ for year 1; 15% FTE for year 2.

Ward, Megan (Co-Principal Investigator). Assistant Professor of English, Point Park University. Specialist in Victorian literature, periodical press, history of the novel, and early artificial intelligence. Recently attended the Digital Humanities Summer Institute at University of Victoria. Project duties: Co-direct the project; collaborate in transcribing, encoding, and researching on Livingstone's manuscripts; document project activities; disseminate results. Time commitment: 20% FTE/2 years.

Wisnicki, Adrian S. (Principal Investigator). Assistant Professor of English, Indiana University of Pennsylvania. Internationally-recognized specialist on Victorian literature, nineteenth-century African history, and British travel literature focused on Africa. Serves as PI for the NEH-funded Livingstone Spectral Imaging Project. Project duties: Co-direct the project; collaborate in transcribing, encoding, and researching on Livingstone's manuscripts; review project results and progress; liaise with major stakeholders; document project activities; disseminate results. Time Commitment: 25% FTE/2 years.

The **institutional coordinators** will serve as our points of contact with the David Livingstone Centre (Karen Carruthers, Anne Martin) and the National Library of Scotland (Alison Metcalfe).