Narrative Section of a Successful Application

The attached document contains the grant narrative and selected portions of a previously funded grant application. It is not intended to serve as a model, but to give you a sense of how a successful application may be crafted. Every successful application is different, and each applicant is urged to prepare a proposal that reflects its unique project and aspirations. Program guidelines also change and the samples may not match exactly what is now required. Please use the current set of application instructions to prepare your application.

Prospective applicants should consult the current Office of Digital Humanities program application guidelines at https://www.neh.gov/grants/odh/digitalhumanities-advancement-grants for instructions.

Applicants are also strongly encouraged to consult with the NEH Office of Digital Humanities staff well before a grant deadline.

Note: The attachment only contains the grant narrative and selected portions, not the entire funded application. In addition, certain portions may have been redacted to protect the privacy interests of an individual and/or to protect confidential commercial and financial information and/or to protect copyrighted materials.

Project Title: Communicating Revealed Texts: Best Practices for Born-Digital Editions Using Enhanced Imaging

Institution: University of Iowa

Project Directors: Paul Dilley, James Brusuelas (University of Kentucky), Brent Seales (University of Kentucky)

Grant Program: Digital Humanities Advancement Grants, Level I

<u>List of Personnel</u>
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James Brusuelas (co-PI), Associate Professor of Classics, Department of Modern and Classical Languages, Literatures, and Cultures, University of Kentucky; Digital Humanities Manager at EduceLab

Brent Seales (co-PI), Alumni Professor in Computer Science, Department of Computer Science, University of Kentucky; Director of EduceLab

Dawn Childress (Project Participant), Librarian for Digital Collections and Scholarship, Charles E. Young Research Library, UCLA

Dr. Hila Dayfani (Project Participant),Postdoctoral Fellow, Centre for the Study of the Bible, Oriel College, University of Oxford

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Grigory Kessel (Project Participant), Senior Academy Scientist, Austrian Academy of Sciences

Verena Lepper (Project Participant), Curator for Egyptian and Oriental Papyri, Ägyptisches Museum und Papyrussammlung, Berlin; Professor of Egyptology, Freie Universität Berlin

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Ira Rabin (Project Participant), Senior Researcher, Bundesanstalt für Materialforschung und -prüfung; Professor at the Centre for the Study of Manuscript Cultures, University of Hamburg

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Overview

Over the past two decades, much progress has been made in non-invasive imaging techniques to reveal unreadable text, especially in multispectral (MSI) imaging to bring out erased or faded writing, and in micro-CT, to reveal writing in unopened manuscripts. We are applying for a Level I grant to fund our project, "Communicating Revealed Texts: Best Practices for Born-Digital Editions Using Enhanced Imaging," which will establish a working group of 14 scholars, curators, and metadata specialists who are currently using enhanced images of ancient manuscripts, from the Dead Sea Scrolls to the Herculaneum Papyri (Appendix, figure 1), the *Living Gospel* of Mani (Appendix, figure 6), and Old Nubian literature. Through a series of monthly Zoom meetings and a two-day summer workshop at the University of Iowa Center for the Book, we will establish best practices for born-digital editions of texts using enhanced images, to show how transcribed text fits into the structure of an imaged manuscript, even if not visible to the naked eye, and to link editorial transcription choices to particular images, enabling others to make an informed, critical reading of these otherwise inaccessible writings. The best practices will be outlined in a White Paper and modeled through several Micro-editions of brief sections of text. The project's goal of establishing an initial foundation for born-digital editions of texts with enhanced images corresponds to the DHAG programmatic priority of "research and refinement of innovative, experimental, or computationally challenging methods and techniques."

Enhancing the Humanities

Across the globe, many important books, both handwritten and print, survive in damaged form, their contents not immediately available to the naked eye. Some of these damaged texts have been widely known for years; others are being identified and discovered in libraries and archives, or uncovered through archaeological excavations. There are now a variety of non-invasive enhanced imaging techniques to reveal the text in these damaged artefacts, especially multispectral imaging (MSI), to bring out erased or faded writing through capturing and manipulating light beyond the visible spectrum, and more recently micro-CT, which uses x-ray imaging to reveal writing in unopened texts, and 3D photogrammetry, a process in which multiple images are captured from various angles that are then used to reconstruct the object in three dimensions. The new readings made possible by enhanced images have led to print editions with an accuracy and scope which would not otherwise have been possible. And yet the use of enhanced images is best documented and assessed through born-digital editions, so that the processes used by editors in the reconstruction of the text are transparent to their readers. In this area much work remains to be done.

Simply put, while there are widely accepted protocols and standards for printed editions and digital editions based on these editions, there is currently no set of protocols or standards for how researchers should use and account for their use of enhanced images, and other computational processes, in digital editions. To address this issue, our team is divided into four sub-groups based on research specialty: first, the Scroll Group, for individuals working on text editions of rolled books; second, the Codex Group, for those pursuing text editions of folded and bound manuscripts similar in structure to most contemporary print books; third, the Materiality Group, for the study of the physical structure of books independent of their writing, including binding structure, as well as their chemical composition, including ink; fourth, the Editing Applications group, which considers algorithmic processes for aiding the editor's transcription of lost or uncertain texts, whether visual (digital paleography) or textual (probabilistic restorations of missing letters/words).

These four sub-groups will meet regularly over the course of the grant, via Zoom and one in-person workshop, as described below in the Activities Section, and the Work Plan. The final goal is a set of protocols and accepted standards for born-digital editions of manuscripts with enhanced images. This will be primarily of interest to researchers, who need guidance on how to produce, read, and evaluate such editions, since techniques such as MSI and micro-CT produce text or features that are not visible to the human eye, and thus present many complexities and challenges beyond existing digital editions. The editions that are eventually produced according to these best practices will in turn be of broad interest to scholars, students, and the public. For example, the members of our project team are currently editing a number of high-profile texts, including the Herculaneum papyri, a large ancient library of papyrus scrolls from a wealthy villa on the Bay of Naples which were carbonized after the eruption of Mount Vesuvius in

79 CE, and which have largely defied efforts to unroll them securely and to read them, despite some successes. Funded by the Andrew W. Mellon Foundation, the University of Kentucky is currently engaged in imaging every opened Herculaneum scroll at the National Library in Naples, Italy (about 5000 unique trays), using custom built photogrammetry cameras and an MSI camera. The goal is to create 3D models of every opened scroll, in which every image ever captured (natural light, MSI, X-ray, etc.) is combined in one 3D image for simple access by those editing the text and reconstructing the formerly intact scroll. Other project members are working on editorial projects of similar scope and historical significance, such as the hundreds of palimpsests manuscripts at the medieval library of St. Catherine's Monastery on Mt. Sinai which have erased and overwritten undertexts that are gradually being revealed through MSI (see Appendix, figure 5); the digital corpus of Old Nubian, the earliest written sub-Saharan African language; as well as the *Living Gospel* of Mani (see Appendix, figure 6), part of an important corpus of seven "heretical" ancient Coptic manuscripts which require multispectral imaging to read their faded ink. Before these important writings can be made available to scholars, students, and the public, in born-digital editions which make use of these enhanced images, a set of best practices, as outlined in the White Paper and exemplified in Micro-editions, must be developed.

Environmental Scan

There are various platforms for digital editions of ancient manuscripts that are already available, or in development. Some of these are currently utilized almost exclusively for transcribing previously published texts, such as the Papyrological Editor (papyri.info), which has strong capabilities for version control and collaborative editing. Others are intended for born-digital publications, and are built around a displayed image, which is connected in various ways to its transcription. These include Virtual Manuscript Room (https://vmrcre.org/download), developed for the digital version of the Editio Critica Maior of the New Testament; T-Pen, originally developed for the edition of medieval Latin manuscripts (http://www.t-pen.org/TPEN/); Brucheion (https://github.com/Brucheion/Brucheion) and READ (https://github.com/readsoftware/read), which is under further development; and the Proteus project (Williams 2015), which developed an editor for creating born-digital critical editions of literary and subliterary papyri, including the expected critical attributes found in print publications (palaeographical apparatus, critical apparatus, testimonia). The digital editions produced by these platforms generally adhere to the standards of the Text Encoding Initiative (TEI). Platforms currently in development also focus on working with 3D images and metadata, such as the Living Virtually project funded by the AHRC at the University of Oxford in collaboration with the University of Kentucky. This project, focused solely on the Herculaneum papyri, is building on an existing tool for the simple and accessible viewing of 3D images in a browser (Smithsonian Viewer), as well as a new tool for generating metadata files (using METS) that account for complex imaging processes and the use of artificial intelligence in text enhancement. Alongside the digital editions and the metadata that platforms such as these create, there is also increasing work in the area of linked open data, which helps unite the various online ecosystems related to the study of the humanities in a digital environment. The ancient Mediterranean world has been a particularly active area of research in this regard, including a recent volume dedicated to the topic (Bond, Dilley, and Horne 2021).

Finally, there is also an emerging corpus of Editorial Applications for both image and text processing which can be combined with digital editors in powerful ways. One area under rapid development involves digital paleography, which includes a set of tools for visualizing different renditions of a given letter in the same document (a functionality offered by READ), or suggested restorations of damaged letters based on artificial intelligence, the ultimate goal of the d-scribes project (https://d-scribes.philhist.unibas.ch/en/). Closely related is Handwritten Text Recognition (HTR), which provides automated transcription of manuscripts from their images based on machine learning (Swindall 2021; Grieggs et al. Forthcoming). Another kind of Editorial Application involves conjectures to restore missing sections of text using artificial intelligence in the context of natural language processing, as opposed to computer vision; current work on the application Logeion are intended to provide this service for Greek and Latin. And EduceLab at the University of Kentucky is not only rapidly perfecting artificial intelligence for ink prediction in the hidden layers of both opened and unopened Herculaneum papyri scrolls, but also

for visualizing what those hidden layers would look like if the human eye could see them (Appendix, figures 2 and 4B).

These existing platforms for digital editing, while adhering to a widely used and accepted standard (TEI), have largely been developed around the idea of images as static 2D objects for reference. Certainly, the development of functionality that links the text transcription to the handwriting in the images in meaningful ways has been a great improvement. But we are at a point of significant change. With enhanced imaging that both provides more data about the materiality of the object and reveals features not visible to the human eye, with emerging artificial intelligence for revealing text and reconstructing text, with emerging metadata and linked data concerns about how to document and account for these complex processes, it is critical that researchers now discuss what our protocols and standards should be when creating critical editions in this new technologically enhanced environment, to ensure transparency. These in turn will guide the future development of digital editing platforms as a new corpus of born-digital editions with enhanced images becomes available.

History of the Project

This project grows out of ongoing work by the Project Director and the Co-Is, much of it in collaboration, to recover damaged ancient texts through enhanced imaging. Dilley and Seales have worked together on the imaging of M.910, an early manuscript of the Acts of the Apostles in Coptic at the Morgan Library & Museum in New York. This parchment codex, in which the leaves have suffered heat damage and are too fused together to open safely, was imaged on site in 2017, and additional fragments were later imaged at SkyScan's headquarters in Pennsylvania in 2019. Their collaboration has subsequently resulted in the identification of Coptic text in the middle of the unopened codex, the first successful effort to read a codex with writing on both sides through the processing of images taken from x-ray tomography (Appendix, figure 4). Seales has also developed the process of virtual unrolling for the recovery of unopened scrolls, such as the En-Gedi scroll (Appendix, figure 3). It has now become a well established process, especially in the context of the intact (not opened) Herculaneum papyri scrolls. Volume Cartographer (VC), developed at the University of Kentucky offers a simple pipeline for the efficient segmentation of volumetric image data (the slicing of data from CT scans to isolate writing surfaces) and the subsequent processes for texturing, flattening, and generating 3D and even 2D images of those segments (Appendix, figure 1). In the texturing process, the University of Kentucky is also applying custom machine learning models to make the carbon ink inside the scrolls visible to the human eye (Appendix, figure 2). In conjunction with this work, Brusuelas has recently published a position paper on the challenges which scholars face in producing critical editions of the text extracted during virtual unrolling, as well as proposed some new conventions to be incorporated into the editions themselves (Brusuelas 2021).

The proposed project now seeks to expand our collaboration with a working group of researchers studying a number of ancient and medieval manuscripts from diverse linguistic and cultural contexts in the Mediterranean and Sub-Saharan Africa . By shifting focus from the act of imaging itself to the process of editing from captured and often further enhanced images, we are addressing critical issues in transparency for those who will evaluate and make use of born-digital editions. Editions based on enhanced images require documentation not only of the complex imaging processes used (e.g., MSI, micro-CT, 3D photogrammetry), let alone access to them when working with the edition, but also documentation of every tool or process used to reconstruct the object and text (virtual unwrapping, machine learning, etc.). A set of best practices, as embodied in a small number of Micro-editions, will make this possible.

Activities and Project Team

The project team is divided into four sub-groups, as follows: The Scroll Group (James Brusuelas, Hila Dayfani, Federica Nicolardi); The Codex Group (Paul Dilley, Grigory Kessel, So Miyagawa); The Materiality Group (Verena Lepper, Ira Rabin, Kristine Rose-Beers, Brent Seales); The Editorial Application Group (Dawn Childress, Barbara Graziosi, Isabelle Marthot-Santaniello, Walter Scheirer). During Phase 1 (9/2023-6/2024), each sub-group will meet monthly over Zoom to discuss their research and editing work as it relates to the creation of born-digital editions with enhanced images. Participants will be encouraged to discuss both their challenges and their wish-list of features. Dilley, Brusuelas, and Seales will participate in all the groups, in addition to their primary assignments noted above, to communicate relevant questions

from one group to another. Phase 2 will consist of an in-person Workshop at the University of Iowa's Center for the Book during June 2024, at which the groups will share their ongoing research with one another, including Micro-editions in progress, and collectively write a draft of the White Paper on best practices for born-digital critical editions with enhanced images, along with notes. Two graduate student assistants in Classics or Book Studies, whose research aligns with the Workshop and who would benefit professionally from it, will be hired to assist with its planning and implementation. Although there is no advisory board, given the cutting-edge nature of these editions, and that most of the current practitioners are participating in this project, the intensive consultations at all stages, and especially at the meeting, will act as our primary means of evaluation. During Phase 3 (7/2024-12/2024), the sub-groups will continue to meet individually, working on relevant parts of the White Paper and Micro-editions, with the last two meetings again consisting of the entire group, to produce and ratify the final versions. For more detail, see the Work Plan, and the Provisional Workshop Schedule in the Appendix.

Final Products and Dissemination

The major outcome of this grant will be a White Paper on best practices for creating born-digital editions with enhanced images. The White Paper will address the proper documentation of the inscribed object and its digital representations; how to document for non-specialists various types of image processing and the resulting image files; connecting the digital representations of 3D objects to 2D images of individual pages or sections; improving the accuracy and documentation of scholarly transcriptions of the revealed texts, including mark-up/representation of various kinds of uncertainty, and the linking of uncertain readings to particular images; the integration of multiple proposed readings by various scholars; the integration of other specialized applications such as digital paleography, handwritten text recognition (HTR), and proposals for the restoration of missing text based on artificial intelligence; connecting digital editions to other resources through linked open data; and how to make born-digital editions accessible to individuals with functional differences. To demonstrate how these methods can be applied in real time, several project members will also produce Micro-editions, that is, born-digital editions using enhanced images of texts. These prototype works-in-progress will include transcription of short textual selections (1-2 pages or scroll columns), on a platform such as READ, Proteus, or Virtual Manuscript Room, with editorial choices explained with reference to enhanced images in the case of ambiguous readings, and the use of editorial applications such as Handwritten Text Recognition or Automated Text Restoration recorded with appropriate metadata. Finally, 3D images from Smithsonian Viewer and Volume Cartographer will be included as well. While far from being a finished product, these Micro-editions will provide an example of some of the best practices in the White Paper, and serve as models for the future development of more robust born-digital editing platforms for texts with enhanced images. Together, the White Paper and the Micro-editions will be a crucial initial step for the coming first generation of born-digital editions based on enhanced imaging.

The White Paper and the Micro-editions will be published online, open access, under a Creative Commons License, through the Digital Scholarship & Publishing Studio at the University of Iowa (see the DMP and the Studio's Letter of Endorsement), as well as submitted to an open-access digital humanities journal, such as Digital Humanities Quarterly, with additional discussion. The White Paper will be jointly authored by all the participants in the seminar. The Micro-editions will be credited to individual editors: the En Gedi scroll to Hila Dayfani; the Herculaneum fragments to James Brusuelas and Federica Nicolardi; the Coptic Acts of the Apostles codex M.910 and Mani's *Living Gospel* to Paul Dilley; the Syriac *Infancy Gospel of Thomas* to Grigory Kessel; and the Old Nubian fragments to So Miyagawa. After the period of the grant has concluded, members of the team will share the results at relevant academic conferences, to reach those who are planning to edit, or are interested in editing, a text with enhanced images. In particular, we will visit the annual meetings of the Society for Classical Studies, the American Oriental Society, the Association for Asian Studies, and the Modern Language Association. Next steps will include further grant applications to develop a virtual editing environment which meets the standards in the White Paper; and to produce full editions of the texts covered in the Micro-editions. The ultimate goal is to establish a community of creators, readers, and evaluators of born-digital critical editions with enhanced images who will continue to develop the practice across disciplinary boundaries.

Workplan for "Communicating Revealed Texts: Best Practices for Born-Digital Editions Using Enhanced Imaging"

This Project will proceed in three separate phases. In Phase 1, participants will meet in one of four specialized groups through monthly Zoom meetings, in order to set a foundation for the white paper on best practices for born-digital editions with enhanced images, as well as the micro-editions. In Phase 2, all the team members will come together for a two-day workshop at the University of Iowa's Center for the Book, to share their research and ideas in-person. In Phase 3, participants will continue to meet in both groups and as a full team to finalize the White Paper on best practices and the Micro-editions.

Phase 1 (9/2023-6/2024)
During the first phase of the grant, the team will meet with their respective groups in one-hour long Zoom meetings, once per month. There are four groups which address various aspects of producing born-digital editions based on enhanced images. The first two address the primary manuscript formats of the ancient and medieval Mediterranean world, namely the scroll and the codex. The scroll and the codex have different physical structures, which present varying challenges in their virtual unrolling, and, more generally, in their digital representation. The second two, on Materiality and Editing Applications, cover general features of born-digital applications that are relevant to both the scroll and the codex, such as how to connect digital representations of a manuscript's physical structure to transcribed sections; and how to record the assistance of various computer applications, such as Handwritten Text Recognition and suggested restorations of missing texts. The format of the group meetings, in which participants share their work with other specialists, will provide an excellent, ongoing opportunity for peer evaluation.

 Dilley, Brusuelas, and Seales will attend all of the group meetings and direct questions that arise in one group to other groups, which can address them, as necessary; this will assure that the groups are aware of their respective deliberations before the meeting of the entire team in Phase 2. The preliminary editions created by the project will be works in progress: for example, none of the current textual editing platforms (Virtual Manuscript Room, READ) have capabilities for representing 3-D digital surrogates; the working group will provide a set of wish lists for future features to incorporate these surrogates, and best practices for linking them with texts, as well as the general layout of a born-digital edition.

 The Scroll Group consists of Hila Dayfani, who will examine several fragmentary Dead Sea Scrolls, as well as the En Gedi parchment roll containing Leviticus, which Seales and his team virtually unrolled through X-ray tomography at the request of the Israel Antiquities Authority in 2016; as well as Federica Nicolardi, James Brusuelas, and Brent Seales, who will consider several fragmentary Herculaneum papyri in Naples that Seales and his team have recently imaged with MSI, photogrammetry, and micro-CT. Participants in this group will explore how best to document the virtual unwrapping process, MSI, algorithmic ink enhancement and prediction, and both the three-dimensional representation of objects and the data derived from photogrammetry in born-digital editions of scrolls.

 The Codex Group consists of So Miyagawa, who is working on a project to create an electronic digital corpus of Old Nubian, the earliest attested written language of sub-Saharan Africa; as part of this project, he will prepare an edition of several Old Nubian codex fragments, making use of Handwritten Text Recognition, using either Virtual Manuscript Room or READ;

and Paul Dilley, who will create an edition of Morgan M.910, a Coptic Acts of the Apostles codex which is too fragile to open, but which has been imaged with tomography by Seales and his team, rendering the center of the inaccessible pages legible. Dilley will also examine several pages of the Coptic codex containing the previously lost *Living Gospel* of the arch-heretic Mani, which have been imaged using MSI and tomography. For both of these projects he is using READ. Grigory Kessel will work on selected palimpsest pages from the library of St. Catherine's Monastery, editing the Syriac under-text, which was erased and written over, but has been made legible through MSI. Participants in the group will explore how best to document the virtual unwrapping process, MSI, and Handwritten Text Recognition in born-digital editions of codices, including palimpsests.

The Materiality Group will address questions related to the representation of the physical structure of manuscripts in a born-digital edition, including the connection between a section of text and the respective section of a manuscript; other information, such as the composition of the ink and the writing surface, will also be considered. Verena Lepper will examine how to represent digital surrogates of challenging writing surfaces which have recently been imaged with tomography, such as folded letters, and papyrus sheets which have been deformed in various ways to create mummy mask cartonnage, that is, stuffing. Kristine Rose-Beers will look at the 3-D images of the codices M.910 and Mani's *Living Gospel*, as they are revealed through tomography, in collaboration with Dilley's textual edition of select pages. Ira Rabin will analyze the representation of scientific data related to the composition of a manuscript, including ink and writing surface, especially as it relates to the imaging, as well as the role of this data in the general layout of the born-digital edition. More generally, participants in the group will explore how the physical structure and composition of manuscripts can be represented through images and other data.

The Editing Applications Group will consider the use of various algorithmic processes that will be a part of many born-digital editions, which are themselves related to enhanced imaging, or would be helpful to employ in combination with it. Walter Scheirer will focus on the use of OCR to produce transcriptions, and appropriate metadata for linking text and image in this context. Isabelle Marthot-Santaniello, PI of d-scribes, works in the related area of automated digital paleography, and is currently collaborating with the creators of READ, a digital editing platform which several members of the group may use, to develop its functionality. Barbara Graziosi is representing Logion, an application that suggests which missing words or letters to restore in the context of creating an edition; this will be especially useful for editions with enhanced images for resolving ambiguous readings. Dawn Childress is a metadata librarian with expertise in the medieval codex who will advise the project on metadata standards and best practices, considering the need for open, transparent data, alongside that of an easily navigable and consultable born-digital edition.

Phase 2 (6/2024)
The second phase of the project will be a two-day workshop at the University of Iowa during which all the project's participants will meet in person, sharing their research and discussing their results in cross-group sessions to outline the major needs of a born-digital edition based on enhanced images as well as other algorithmic processes. The workshop will be held during the summer of 2024, at a time convenient for all the participants, most likely over two weekdays in June or July. We do not anticipate any travel complications for the participants, but will determine a date at the outset of the grant that works for all involved. The University of Iowa

Center for the Book (UICB), at which PI Dilley is affiliate faculty, will provide meeting space for the conference, both for small-group and project-wide meetings; there will be short supplemental activities related to the UICB's collection of teaching models of ancient manuscripts; and an overview of the activities of the Iowa Initiative for the Scientific Imaging and Conservation of Cultural Artifacts (IISICCA), of which Dilley is the director. Two graduate students, from the Classics department or the Center for the Book, will be hired under the grant to manage logistics, including travel and food arrangements, as well as room preparation and video recording of the sessions. A draft of the workshop schedule is included in the Appendices. We believe that it is important to have a series of meetings in which everyone meets face-to-face, which will aid knowledge discovery through whiteboarding and collaborative drafting. It is also an opportunity to share the initial results of the four specialized groups with the rest of the project team, and to prepare for the last six months of meetings to produce final versions of the White Paper and the Micro-editions.

On the first day of the workshop, project members will introduce themselves, and then break into separate groups to prepare presentations. This will be followed by the presentation of the individual Micro-editions in one afternoon session, followed by a discussion of how they relate to general best practices by the entire team in the second afternoon session. On the second day of the workshop, the Materiality and Editing Applications groups will present on the main insights from their deliberations over the course of the Phase 1 meetings, with an emphasis on how to include these aspects most seamlessly into a born-digital edition, and the role of metadata in this process; this will be followed by a discussion of these issues by the entire team. Everyone will then reassemble for the final two afternoon sessions: in the first we will discuss and whiteboard the primary issues related to best practices as they have emerged at the meeting; and then, in the second session, we will produce an outline and notes from our deliberations.

Phase 3 (7/2024-12/2024)
After the summer in-person workshop, the subsequent meetings will continue via Zoom, at the rate of one per month, beginning in September of 2024. There will be two meetings of the individual groups, at which participants will discuss the final stages of their sample editions, especially as they relate to the proposals and discussions of the summer workshop. The final two meetings will include the entire working group, with the goal of producing the final White Paper on best practices, through a series of two further drafts building upon the document produced at the summer workshop. The PI and co-PIs will be responsible for approving the final draft of the White Paper, which will be co-authored by all the participants; the individual authors of the Micro-editions will submit the relevant files to the co-PI by the end of December of 2024.

Data Management Plan

Data Management Responsibilities
As Project Director, Dr. Dilley will oversee the data management plan. The Digital Scholarship and Publishing Studio at the University of Iowa will ensure all data is stored appropriately and made publicly available as needed, including a dedicated URL, front- and back-end development, and archival needs (see the Letter of Commitment from Dr. Tom Keegan, director of the Studio). Co-Is Dr. Brusuelas and Dr. Seales will also provide storage managed by EduceLab at the University of Kentucky. For both short and long-term storage, research data is stored on one of two 305TB NAS servers managed by the University of Kentucky's Center for Computational Sciences. For the duration of the project, administrative documents (budgets, papers, etc.) will be stored in a Central ITS-managed Microsoft SharePoint, with access limited to project members. Upon the project's completion, a unique, publicly accessible SharePoint will be created for the dissemination of reports and/or data resulting from the project. It is the responsibility of all project members to submit data for storage as it is created. Moreover, to ensure uniformity, all project members will adhere to standards in generating data formats: metadata standards, controlled vocabulary, filename management, etc.

Data
The kinds of data to be collected are:

Video Recordings: all Zoom meetings (mp4) will be captured during the grant period. University of Iowa will initiate every zoom meeting. The recordings will initially be captured on the Project Director's laptop. Copies will then be stored at the University of Iowa institutional repository, and made available to all project members.
Project Workshop Files: During the two-day workshop at the University of Iowa, the project will engage in the whiteboarding and the initial drafting of our protocols and standards. The data types generated during this meeting will be in the from word files (docx) and image files (png images of whiteboards).
Micro Editions: project members using existing digital platforms to create our prototype micro editions will result in xml files utilizing the standards of TEI. To compensate for new conventions and standards required for born digital editions based on enhanced images, which do not currently exist, prototype designs in file formats such as docx, pdfs, and xml will also be included for visualization purposes.
Machine Learning Models: resources for ink enhancement and prediction, photo-realistic rendering of text in unopened artefacts, digital palaeographical analysis, and digital philological reconstruction produce essential metadata of these processes in json files.
Enhanced Image Files: file types are tiff, obj (3D), and png. Working group members working on micro editions come to project with their own artefacts and enhanced image data. For micro editions, the project will only collect and store images of text corresponding to each micro edition. For Herculaneum papyri specifically, project Co-Is at the University of Kentucky will make available any relevant data to working group members in this space.
Presentation Materials: any power point presentations (pptx files) arising from invited talks at conferences will be stored and made available to project members.