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Chapter 1
The Integration of Digital Heritage Documentation and Online Archive Building

R. Michael FEENER

In this essay, I would like to address the issue of how the collection of raw data in the field can be combined with digital assets produced in a lab to create an integrated multi-media archive. In other words, how can the coordination of primary field documentation and digital processing work together in a coordinated way to construct something new that is more than just the sum of its parts? By way of illustration, I will introduce some of the more concrete aspects of the work that my team and I have been doing on the Maritime Asia Heritage Survey[1] both in our Digital Heritage Documentation Lab at Kyoto University, and in the field with our Survey Teams in the Maldives, Indonesia, and Thailand.

Over recent decades, the rush to digitize just about everything has both responded to, and in turn inspired further technological innovations that are transforming practices of scholarship across a wide range of fields. Work in new modes that digital technology affords has produced a massive amount of new documentation of diverse kinds of source material, from photographs and audio-video recordings to text scans, geospatial information, and 3D models. While the digital revolution was initially traumatic for some of the more established

1 The MAHS online archive is open-access at: <https://maritimeasiaheritage.cseas.kyoto-u.ac.jp>

Our project is financially supported by Arcadia, who share our firm commitment to open access publication of data: <https://www.arcadiafund.org.uk/promoting-open-access>

academic disciplines, particularly for the Humanities, after an initial rush to the ramparts around the turn of the twenty-first century, more scholars have been turning towards some more reflective critical engagement with what new media might mean for the interpretation of cultural phenomena.

Critical reflection on the epistemological implications of dealing with digitized culture prompts critical explanations of the new media ecology in which our work is now embedded. Well beyond the challenges of digital literacy and the development of small-scale techno fixes, we need to grapple on a conceptual level with new ways of conceiving of the very work of scholarly interpretation of Big Data and "born-digital artefacts."[2] As Jerome McGann remarks in conceptualizing what he calls a new republic of letters: "As we proceed to digitize our print and manuscript objects, and hence our engagements with those objects become primarily digital engagements, the living culture that created and sustains them itself also becomes an object" (McGann 2014).

The early rush to digitize the archives was pursued in relation to work done in the field of scanning literary texts — first primarily those in Roman script via OCR work on printed texts and subsequently of manuscripts in a wider variety of languages. In the course of such developments, some scholars of philology have come to recognize the particular strengths that their traditions of scholarship might be brought to bear on grappling with some of the new issues that arise alongside these new ways of seeing, reading and knowing.

Some historical perspective can then be helpful to try to frame our experience of the current moment. Consider, for example, how the very the form of a Codex, a book stitched between covers, helped to shape the formation of the humanities in the Western academic tradition that

2 These are particularly fast-moving conversations, often adjusting on the fly to both technological advances and academic fads.

has now come to assert a global influence — or how scholarly journal articles played a similarly formative role in the development of the modern sciences. Then we might begin to ask ourselves new questions about what kinds of scholarly work as well as digital formats and informatics structure — such as those of online multimedia archives — might facilitate. What new fields of scholarly interpretation might be born out of our engagement with these new media? And, how will specific modes of access and representation frame new histories of material culture?

In this brief chapter, I would like to try to open up some lines of discussion with particular reference to the work of my colleagues and I on the Maritime Asia Heritage Survey (MAHS), both in our Digital Heritage Documentation Lab at the Kyoto University Center for Southeast Asian Studies (CSEAS) and in our fieldwork in Indonesia, Thailand, and the Maldives.

The Maritime Asia Heritage Survey (MAHS)

The Maritime Asia Heritage Survey works to discover, inventory, and digitally document critically endangered heritage sites and object collections in coastal and riparian contexts across southern Asia to create an open-access digital archive of this material. Based upon a pilot study in the Maldives (Feener et al. 2021a), the MAHS has expanded operations across several counties along the Maritime Silk Road.

The MAHS pursues its aims of both producing new forms of digital documentation and facilitating open access and secure long-term preservation. Our integrated project design encompasses primary field documentation in multiple countries, digital archive construction, and metadata management, in addition to the production of new digital assets by the MAHS Lab. In what follows, I present a structured overview of

our project. A primary selection criterion for field documentation sites is the relative severity of environmental and human threats to tangible cultural heritage.

Concept, Scope, and Schedule

Many of the coastal communities and riparian regions of maritime Southern Asia are at the front lines of climate change. Parts of the coast of Aceh, Indonesia have been suffering from dramatically increased risk of coastal erosion and flooding exacerbated by rapid subsidence following the 2004 earthquake and Indian Ocean tsunami. This has exacerbated the impending loss of areas that were historically part of the Aceh Sultanate in the sixteenth and seventeenth centuries, including major burial grounds, mosque complexes and other sites that are now either underwater or quickly going under.

IMAGE 1
Damage to an old Muslim cemetery in Aceh, Indonesia
Source: Author

Other complex examples are myriad across the region, but some of the most drastic threats confront the low-lying islands of the Maldives, where accelerating coastal erosion and rising sea levels endanger the long-term inhabitability of the entire nation:

Threats to the material heritage of the country are, however, not limited to environmental factors. In 2012, vandals stormed the National Museum in Male, severely damaging rare surviving artefacts from the country's pre-Islamic past.[3]

IMAGE 2
Vandalism at the National Museum of the Maldives
Source: Author

In this "100% Muslim" nation, moreover, many Islamic heritage sites also routinely suffer intentional destruction by human hands – especially older cemeteries and shrine mausolea (*ziyaaraiyy*), which were traditionally centers of ritual observance that are condemned by currently dominant reformist interpretations of Islam.

3 For a brief overview of the history of Islam in the Maldives, see: (Feener 2021).

IMAGE 3
Traditional Muslim shrine mausoleum in the Maldives
Source: MAHS

Given the nature of the dire, compound threats facing the Maldives, the MAHS is undertaking a systematic survey of every island in each atoll. Starting in the pilot phase of the project in the Maldives, we began a systematic survey of every island in the Maldives — the first-ever undertaking of its kind — which is expected to be completed by the end of 2025.

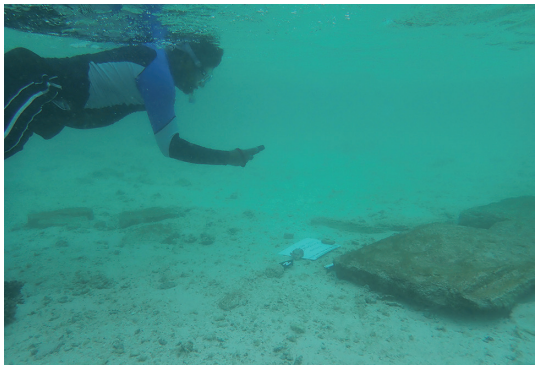

IMAGE 4
Field Documentation of an historic Muslim cemetery lost to coastal erosion in the Maldives
Source: MAHS

As work progresses on that front, the MAHS has also expanded to deploy new field teams to use the same systematic field survey methodology and data collection protocols in other countries, with ongoing operations in Indonesia and Thailand.

IMAGE 5
Terrestrial LiDAR scanning of a ruined mosque in the Maldives
Source: MAHS

Working with local governments and communities on every inhabited island and using aerial LiDAR and systematic field walking on the many more uninhabited islands, the Field Team documents any surviving pre-modern material traces of inhabitation from wells, cowrie deposits and ceramic scatters to ruins of Buddhist temple sites, mosques, and vernacular domestic structures.

In other countries where we work, our field survey documentation is selective, rather than comprehensive. In Indonesia, our work focuses on the eastern islands of the archipelago, which have historically received far less archaeological attention than have Java and Sumatra.

IMAGE 6
MAHS field documentation of a rock art site in eastern Indonesia
Source: MAHS

We work in consultation with the Indonesian Directorate General of Culture at the national level. In such a large and diverse country, it is not possible to document all historic and archaeological sites, and so the MAHS works with local government agencies and local communities to determine priority sites and objects for documentation. The selection process thus involves consideration of multiple factors, including significance to the local community, the existence of previous documentation, and the severity of threats facing a particular site or collection. Our methodology attempts to document the local significance of particular sites by incorporating the video recording of oral history interviews to complement our empirical data collection in the field. With written consent for publication, those videos are uploaded to our project's YouTube channel for maximum accessibility and archived for long-term preservation.

Project Teams

To record this wide range of field data, the MAHS deploys full-

time teams in each country where we work. Each MAHS Field Team is comprised of seven full-time members, including a Country Coordinator, Field Survey Leader, Archaeologist, Architect, Surveyor, Photographer, and Data Wrangler.

IMAGE 7
MAHS Field Team recording an abandoned village in the Maldives
Source: MAHS

As most of the areas that we work in have limited capacity and access to some of the technologies needed to produce high-quality digital heritage assets, the Maritime Asian Heritage Survey provides the resources to help local field teams and invests significantly in capacity building. The aim is to establish solid foundations upon which future work can be conducted to make the open-ended expansion of this digital archive possible.

During the pilot phase of our work in the Maldives, we were challenged at first by the lack of experienced field documentation personnel. We were, however, able to second an officer from the Department of Heritage to help identify and train other Maldivian candidates. We also recruited field staff first in Aceh, Indonesia — where my colleagues and I had done some previous work — and brought a number of the most talented local partners we had there to

begin training a cadre of Maldivians in field survey team methodology. When the pandemic hit, our colleagues from Indonesia went back home to Indonesia, but those in the Maldives stayed in place. Their two groups then came to form the cores of the two national teams that currently work in each country. The field teams are trained in the technical operation of both traditional survey equipment and newer digital technologies, including both terrestrial and aerial LiDAR. All of these tools are then used according to the standardized project methodology.

Field Survey Methodology

In the Maldives, only about 200 islands of the over 1200 islands of the country are currently inhabited, but some of them were previously inhabited. What our survey team does on a lot of these uninhabited islands, is to anchor offshore, wade the equipment to the beach, and set up a point to deploy the drone to capture data that can be used to produce an orthophoto map. We then proceed to systematically field-walk the island from the beach to the interior with bush knives and GPS units in hand to identify and mark potential sites. Once we find a site, we are then able to set up and follow data collection protocols.

IMAGE 8
Aerial photo and CAD site plan for a ruined Buddhist monastery in the Maldives
Source: MAHS

On the inhabited islands of the Maldives, we have developed a productive method of engagement with local communities, starting upon our arrival with a formal meeting with the Island Council to both explain our work and to learn from the local community about any sites that they would like to prioritize for heritage documentation. This then becomes another major component of our site selection in addition to the ground proofing of sites listed on the modest registry of the Maldives Department of Heritage and new discoveries made in the course of fieldwalking by the MAHS Maldives Field Team. In the course of our work, we also document local collections held by Island Councils and individuals who consent to have manuscripts or other objects recorded and made open-access available online as part of the digital archive. Texts are systematically photographed and processed for IIIF deep zoom and published via a Universal Viewer plug-in on the MAHS website.

Each day, the work of the MAHS Field Teams produces a multimedia batch of information, which is loaded up to the cloud from the field teams by our data Wrangler. This is sent to Kyoto University, where we have established a digital heritage documentation lab at the Center for Southeast Asian Studies. There, the MAHS has a team including staff specializing in database construction and management, photogrammetry, CAD, GIS, LiDAR visualization, documentation editing, and other aspects of data processing.

Given the diverse forms of material recorded by the Field Teams and the range of digital assets created and curated by the MAHS Digital Lab in Kyoto, our dataset extends considerably beyond the established parameters of a traditional archeological survey. We have thus had to confront new challenges of how to organize, present, share, and store this diverse multi-media assembly. Each component must furthermore be integrated and conceptualized in relation to one another in ways that

would not be possible within a traditional archaeological monograph publication format.

Our digital archive is designed to be integrated with multimedia digital assets and connected metadata in ways that facilitate dynamic search results and focus on cross-referencing in ways that can support practical usage, as well as the formulation and exploration of new research questions. We also create contextualizing reference materials that can help users coming to the website with tools for interpreting the dataset. This includes an annotated timeline that we have constructed out of local source material, a virtual library, where we have negotiated for open access rights to important pieces of scholarship on the country or sites where we work and make those publications easily available in one place — thus providing resources for contextualizing our dataset and supporting new research on related topics. Our most ambitious work of creating new reference materials for contextualizing the MAHS dataset has been the production of an illustrated glossary of Maldivian material culture that provides vernacular Dhivehi names and English-language glosses for different ornamental motifs, architectural features, and a wide range of traditional objects.

Data Structure, Access, and Long-term Preservation[4]

The multimedia records, digital heritage assets, and reference materials of the MAHS online archive are anchored in a database that is built on the Arches platform. Arches is an open-source software package that was first developed by the Getty Conservation Institute and the World Monuments Fund. This GIS-referenced database

4 The following section draws upon and summarizes a longer discussion of this topic that has been previously published as: Feener, Ishikawa, and Daly. "Big Data in the Humanities" (Feener et. al. 2021b).

architecture uses a customizable resource graph framework that opens up rich possibilities for thinking about how the pieces of data relate to each other. The MAHS has developed its Arches instance customized with record types that can accommodate a full range of materials ranging from individual pottery sherds to complex 3D structural models that have been produced through a combination of laser LiDAR and photogrammetry. Our Arches instance, furthermore, not only structures records collected by our own Field Teams, but also provides a framework for the incorporation of data from pre-existing datasets into the MAHS online archive. There is a tremendous wealth of documentation of archaeological and historical sites in the region already out there that has been collected by governments, museums, academic researchers, and community-based heritage organizations over recent decades. These datasets contain relevant, but previously unpublished material on heritage sites, structures, or collections of objects from all across the region. However, much data of this type has been largely unknown and/or unavailable beyond rather limited circles. To address this, the MAHS works closely with diverse stakeholders who are willing to join us in publishing their materials as open-access data available via the online archive.

To date, we have been working with a range of partners ranging from large governmental bodies such as the Indonesian Directorate General of Culture to international academic research projects and small, specialized local museum collections. However, much of the data that has been shared with us by various partners is idiosyncratically structured and/ or difficult to access, and each must be accessed and searched separately — making the work of comparison and connections frustratingly difficult if, that is, the information is even publicly available. The MAHS thus works with the owners of such datasets to standardize, integrate, and even translate

their material into a searchable format that can be integrated into our online archive. In this way, a number of previously unconnected datasets can now be seen simultaneously alongside each other, mapped using GIS, and linked to a host of multimedia digital heritage assets. Our entire online archive is open access via our Arches database with larger files for associated point clouds, 3D models, and videos materials that are made easily accessible on our SketchFab, YouTube, and OpenHeritage3D accounts.

In addition to ensuring open-access to all of our data, the MAHS also provides for the long-term stable preservation of this digital archive. To ensure the long-term future accessibility of these digital assets, all our metadata is consistently formatted, and each batch deposit includes an accumulative README file containing a detailed asset inventory. In addition information is provided on general rights for reuse, contact information for project administration, and a recommended citation so that those people or those other datasets that have contributed to ours can get properly acknowledged when anybody uses their data.

We save our files both in the current application formats and also export them into the most widely used and durable file types available for various kinds of data at the moment of deposit. The university libraries and systems of both Kyoto and Oxford provide secure digital repositories of our complete dataset on two different continents to ensure long-term survivability. The latter is under the rubric of the Oxford Research Archive, which assigns a permanent DOI for data deposits for a project and provides long-term curation in the Bodleian Library's long-term archival digital storage. These redundancies are designed to ensure the maximum longevity and utility of the digital archive for future generations.

Conclusion

The Maritime Asia Heritage Survey is amassing a large amount of data from diverse sources in the course of our work and working to make sure that it is both archived for long-term preservation and made freely accessible online. Although the primary source material is of a kind that might be traditionally associated with fields like history and archaeology, we also devote considerable critical thought toward issues related to the kinds of digital assets we create and how the material we generate through our work might be preserved, transmitted, used, and possibly transformed in new directions in the future.

Scholars have long considered how their writings might be read and interpreted by posterity. Today, however, we find ourselves thrust into new kinds of consideration of our scholarly obligations to both the past that we endeavor to preserve, and to the future accessibility of what we are producing. Consideration of these kinds of questions raises a host of issues about the nature of archive building in the 21st century that go beyond earlier discussions of simply digitizing sources. Earlier conversations on digital humanities focused on issues arising from the work of scanning the archive in ways that tended to cast the situation as one of having a stable body of material that just had to be moved into a new media. Then, as Big Data Sets entered into consideration, a host of new issues involved with archiving the digital came to the fore. These include the structuring of a multimedia digital archive that incorporates existing digital records, scanned paper documents, primary archaeological field survey data, and a growing number of new digital assets that we create in our own lab and the implications carried by the recording of material culture into such virtual forms. It is not simply a matter of the migration of a traditional type of repository of cultural artifacts onto a new digital platform. Rather, our work today is more

about shaping a different kind of archive that allows for new forms of engagement by diverse users today while also recognizing that there might be a whole other range of unexpected usage of our digital archive in the future.

The consideration of such questions by the MAHS reflects emerging trends across interdisciplinary engagements involving digital resource creation and the exploration of new frontiers in the humanities in a stimulating new collection of studies that appeared last year on cutting-edge intersections of historical geography, GIS science, and textual analysis. Charles Travis, Francis Ludlow, and Ferenc Gyuris, for example, aim to "conceive of new ontologies and epistemologies to understand the dynamics of human and environmental phenomena in the past, the present, and our possible speculative futures." (Travis, Ludlow, and Gyuris 2020, xii). More sustained critical attention to the conceptual dimensions of new forms of digital archive can thus help us to do considerably more than just make additional material more widely available. For while pursuing such work, we must also be open to the exploration of questions about what forms of knowing might be enabled or hindered by the kinds of resource records and digital assets that our field and lab teams generate, and the potential usages for the archive which we are assembling out of that material, including those afforded by AI. This also needs to include a forthright acknowledgement that, almost inevitably, there will be unintended usage of our data in the future along trajectories that we are not yet able to imagine.

In closing, we would also like to emphasize that the work of constructing a complex multimedia archive of diverse digital heritage assets entails complex institutional as well as intellectual considerations. Beyond the first-order issues of obtaining project funding, recruitment, and logistics, a project such as this can also pose significant challenges to the traditional University structures of our respective institutions.

We see this, for example, in issues involving the relative positions of computer technicians and traditional academics in the structures of university facilities and departments, as well as in the still unexplored areas of developing mechanisms for assessing the quality of digital assets that might be similar to the old guild-based model of peer review that is central to both editorial authority and performance evaluations in academia today. In addition, a project such as ours must draw on the support of the university and its resources and potentially drive changes to other parts of the university system, including the IT office, Media Center, and Library. There are a tremendous number of issues involved in supporting a project of the scope of the MAHS, but to date, there has been little cross-institutional discussion of these issues. More will certainly be needed as big data projects in the humanities continue to develop in new directions in the future.

Our work on the MAHS aims to enable utilitarian access to data for use by government agencies, heritage management professionals and local communities. Beyond that, however, the overarching goal of our work is something bigger: to assemble, to preserve, and to freely share a body of empirical material that can be dynamically engaged with by anyone looking for resources to help them explore an open-ended range of questions in new ways. This essay has been an attempt to present the ways in which we have sought to facilitate this in the design and implementation of the MAHS in the hope of generating further constructive conversations.

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Chapter 1. The Integration of Digital Heritage Documentation and Online Archive Building

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