Introduction

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Cultural Heritage is a term that embraces an extremely large and diverse set of knowledge and culture manifestations. In this book, we adopt the official UNESCO definition of Cultural Heritage:

> Artifacts, monuments, a group of buildings and sites, museums that have a diversity of values including symbolic, historic, artistic, aesthetic, ethnological or anthropological, scientific and social significance. It includes tangible heritage (movable, immobile and underwater), intangible cultural heritage (ICH) embedded into cultural, and natural heritage artifacts, sites or monuments. (UNESCO definition of Cultural Heritage: https://uis.unesco.org/en/glossary-term/cultural-heritage)

The idea of a Digital Cultural Heritage is as broad as Cultural Heritage itself (Cameron & Kenderdine 2010), with an increasing diversity of tools and practices in all areas: from preservation and conservation, to new types of archive and museum management (Giannini & Bowen 2019), virtual and augmented reality experiences (Champion 2021), gaming (Reinhard 2018), landscape study (Reinhard & Zaia 2023; Douglas & Harrower 2013; Lake 2020), interpretation of sites and cultural dynamics (Fredrick & Vennarucci 2021), and so on.

The application of digital techniques has certainly provided new insights into the study of material artifacts and practices: for example, by allowing the digital reconstruction of fragmentary objects or monuments (Koller & Levoy 2006), providing new opportunities for the accessibility and preservation of damaged or endangered heritage (Vafadari, Philip & Jennings 2019), and tremendously improving access to sites and museum collections (Noehrer & Yehudi 2021; Balbi & Marasco 2021). It does not, however, come without issues: these include problems of digital obsolescence and long-term preservation (UNESCO 2003a), algorithmic and technological bias (Hacıgüzeller, Taylor & Perry 2021), quality of digital reproductions, data and standards heterogeneity (de Almeida & Wefers 2017). The errors and limitations, and sometimes even destructiveness, of technology in the management and study of material heritage collections have also been highlighted by scholars (Bentkowska-Kafel & MacDonald 2017).

The key question relates to the impact of digitization, digital analysis and electronic dissemination on the study of material and immaterial aspects of the past. This book starts from the idea that we can use the multifaceted dialogue between concepts of "material" and "immaterial" to explore some of the ethical and epistemological aspects of this debate. This duality of materiality and immateriality provides a conceptual starting point that can transcend the boundaries of disciplines, practices, and geographical areas.

It is no mystery that the materiality of cultural heritage collections (both in terms of artifacts and in terms of space where they are or were located) is an important component and potential limitation to the application of computational techniques (Ciolfi 2021). However, the relationship between material and immaterial is more complex than this simple dichotomy.

First of all, the idea of cultural heritage embraces both tangible and intangible manifestations and practices, including material expressions of culture, such as objects and sites, but also the immaterial systems of knowledge developed by communities, or Intangible Cultural Heritage (UNESCO 2003b). On the other hand, digital techniques are usually associated with the idea of immaterial, but are also dependent upon a very concrete set of material circumstances and infrastructures (Geismar 2018). Furthermore, some of the issues connected with the "immateriality" of digital technologies have very "material" repercussions: for example, on matters of intellectual property and ownership, or on the inequality of access to the necessary resources to implement or benefit from digital practices.

While it is, of course, impossible exhaustively to cover the very broad range of techniques currently applied in the field, we aim to give a representative range of responses to these questions, from scholars and practitioners of different backgrounds.

We have aimed for as diverse as possible a selection of contributions, along several axes. On the one hand, authors of chapters in this volume are from a range of academic disciplines and backgrounds, including working specialists,

cultural heritage practitioners, legal experts, established academics, precarious project staff and early-career researchers. Disciplines represented include archaeology, philology, history, classics, anthropology, museum studies, social science, law and development, digital humanities and library science, not to mention the majority of authors with interdisciplinary and multidisciplinary interests. There is also a variety of linguistic origins, geographical areas and cultures represented (both within the content and among the authors): a great many chapters were written with multilingual concerns and experience of cultural translation and sensitivities.[1] Alongside and cutting across this variation in background are several different scholarly methodologies to the digital study of the historical world and its cultures, ranging from 3D modeling and spatial analysis, through text encoding, transcription of inscriptions, to intellectual property and heritage sovereignty.

On the other hand, and perhaps more central in reflecting a diversity of content, chapters in this volume bring different formats and academic approaches to the broader discussion. There are several theoretically oriented chapters (including those of Vitale, Filosa, Palladino, Granados[2]), which explore the impact of digital representation and analysis to particular areas of historical heritage and scholarly inquiry. Without limiting themselves to a single project, these chapters consider the impact on research, ethics, culture and conservation of a range of digital methods in the study of material and immaterial heritage. Others work from specific case studies involving digital reproduction, restoration or curation (and often, but not always, involving their own work) to discuss the wider issues of the volume, whether intellectual property from a legal perspective (Okorie), ethically responsible digital collections (Kahn), or the scholarly use of digital models and immersive environments (Lucarelli).

Some chapters survey their field as part of the framing of exploring digital methods in heritage, while others pull out key examples of good practice, or even make provocative proposals for more rigorous or ethical behavior needed by the discipline. Some actively raise research questions in the area of digital heritage, or engage with critical issues drawing on previous work, or indeed address the disciplinary agendas from such a high altitude perspective that individual examples are less significant. As we shall argue shortly, the volume as a whole makes this wide variation into a coherent argument—with the obvious caveat that there is no single or exclusive answer to most of the questions addressed.

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[1] We have made no attempt to restrict contributions to this volume to "own voices" authors, although the desirability of collaboration with and leadership by local practitioners is a recurring theme.

[2] As a shorthand, in this introduction we will refer to chapters by the surname of the first-listed author only.

With such a variety of authors and concerns, the challenge is not only to reconcile scholarly practices, but also to translate frames of reference, to ensure exchange and communication across the boundaries imposed by discipline and occupation. The different concerns of legal specialists, archivists, or cultural heritage practitioners, the effects of cultural background and expected audience, even styles of communication and audience expectation substantively impact both writing style and content.

Cutting across this diversity of backgrounds and concerns requires a particular kind of work to ensure that content is accessible across the board of possible readers, but also that the specific nature of each contribution is meaningfully communicated without banalization. This process of translation also brings a certain amount of exploration and discovery, in domains and fields that usually do not communicate with one another.

Thanks to this process, we discover strong underlying themes, more or less obvious, that are shared across the chapters of this volume: the order of reading we propose, approximately based on types of technology and of objects of study, reflects only one of the many ways in which the content could be read.

More or less overt threads, including some of the most pressing issues in the field of cultural heritage, recur throughout many or all chapters in the volume, although they may be approached in very different ways. Several chapters address digital encoding of texts found on inscribed objects (Baba, Filosa, Bianchini) and manuscripts (Elagina, Woodward); others present digital reconstruction, from 3D modeling of architecture and other archaeological elements 3D (Vitale, Lucarelli), to immersive environments and virtual representations of ritual space and landscape (Palladino, Lucarelli).

Along another axis of commonality, several chapters deal with the development, adoption and adaptation of digital standards and community practices (Baba, Filosa, Bianchini, Elagina, Woodward, Granados); several likewise focus on issues around intellectual property, sovereignty and stewardship of heritage data (Baba, Filosa, Granados, Kahn; especially of course Okorie). Other recurring themes include cultural heritage management, especially via archives and digital libraries (Granados, Kahn, Okorie), and the importance of documentation, metadata and paradata relating to research materials and outputs (Vitale, Filosa).

Other threads that can be discerned throughout this volume may be less obvious, but reveal common concerns and preoccupations that recur across different fields, materials and geographical areas. Several chapters concern themselves with epistemological questions regarding representations of heritage information, especially with regard to the digital technologies that impact on, improve or hinder such representations and models (Vitale, Palladino, Kahn).

Others take a range of approaches to questions of access and community building, including both the involvement of local bodies of knowledge and practice to improve standards and workflows, and the epistemology of digital methods themselves (Woodward, Palladino, Granados, Okorie). Equally, several chapters address the related accessibility issues with intellectual property

(Okorie); decolonization and restitution (Kahn); protection of and sovereignty around local heritage (Granados). Throughout the volume there is an awareness of the importance of open access in making research available, but also the reasonable limitations of this commitment (*passim* but especially Baba, Filosa, Woodward).

The commonalities, threads and patterns in the approaches and concerns that we trace throughout this volume cannot obscure the fact that we have eleven chapters by seventeen authors from different academic, heritage, professional and other backgrounds, across four continents, and with as many different approaches even to sometimes closely related questions or issues. The themes addressed by this volume are of sufficient complexity and ethical ramifications, not to mention sometimes subjective or highly contextually contingent, that we should expect to find differences in approach, tensions and even disagreements. Neither this volume, nor arguably any single chapter, presents a monolithic or monotonous view of the issues, and even less of the solutions to them.

The diversity of responses to heritage restitution and other decolonization practices and approaches signals one of the most complex and environmentally contingent questions under consideration. Some of our authors deal with centralized repositories such as Papyri.info, that are full of material overwhelmingly taken from North Africa and the Middle East, many of which now reside (justifiably or otherwise) in Western institutions (Filosa). In other cases we see manuscripts that belong to localized traditions now spanning modern borders (Elagina). While recognising the care and nuance such questions deserve, it is fair to say that we overwhelmingly reject a facile "world's heritage" argument often put forward to support the status quo and existing/historical power relationships (*e.g.* Cuno 2008; Jenkins 2018).

Power and privilege also impact on the way we research and record heritage and history. The majority of digital infrastructures and standards adopted today are Western in provenance and epistemology. Projects that adopt Western-born and promulgated digital standards as opposed to locally generated systems have made decisions that affect the way digitization itself is conceived (Bianchini, Elagina, Woodward). In contrast we see a Japanese digitization project that originated locally, but whose data was later converted into broadly adopted Western digital technologies like Linked Open Data (Baba). Elsewhere our authors discuss how current Western standards can be adapted to and given additional nuance by local knowledge (Palladino, Granados).

Large-scale projects that deal with collections including localized heritage, inevitably impose some centralization of methodology, modeling and standards (Filosa, Bianchini, Elagina, Woodward, but also almost *passim*). It is not news that all modeling—digital or otherwise—is interpretive and therefore lossy, as most have observed. Availability of funding, implied authority, stable employment, and many other axes of privilege profoundly affect the

development of digital projects worldwide; even where the selection bias toward Western heritage is avoided, infrastructure, research agendas and prestige accrued follows many of the same lines.

The very opportunity to write about the scientific and ethical concerns around the study of heritage is contingent on a spectrum of privileges. For salaried (leave aside tenured!) academics, publication of research is a valued part of the job description and career advancement pathway. Heritage professionals do not always have writing and publication as a core part of their contracted responsibilities, and are not rewarded for it in the same way. Further, freelance researchers in many relevant fields depend on receiving remuneration for their written output, whether in the press or for professional bodies, whereas academic publications are not modeled around this way of funding authors. These inequalities will not always or necessarily be superable, but we ought not neglect the fact that they exist.

Sometimes overriding, and often inseparable from, these sorts of issues, the inevitable individual sensitivities, interests, passions, biases, expertise and research agendas also contribute to the diversity of approach and attitudes in this volume. This mélange may on occasion lead to clashes, but more often it leads to a complementarity of approaches, a useful corrective to missed perspectives, and reminder of the subtlety and complexity of our own fields.

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