RESEARCH ARTICLE

Digital Archaeological Ethics: Successes and Failures in Disciplinary Attention

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The assumption that archaeologists will behave ethically in fieldwork, analysis, and publication relies on a further assumption, that they have been taught what ethics mean in those contexts. Though the ethics of participation in archaeological contexts have been defined (and refined) over the life of the discipline, the emergence of digital technologies as tools, and the centering of digital methodologies in archaeology have created new areas requiring ethical consideration. The adoption of discipline-wide standards of digital archaeological ethics has been slow, and the output of digitally centered archaeological data and published products has outpaced ethical discussion and implementation of ethical guidelines. The result is a generation of archaeologists who are versed in digital forms, but whose work is ungrounded in consensus-led ethical frameworks that explicitly reference the digital. This paper details how ethics should be considered as digital archaeology moves forward, with discussions of existing successes and failures.

1. Introduction

Ethics are not typically considered optional in modern archaeology, with established guidelines and processes for determining ethical compliance present in both the academic and commercial aspects of the sector. However, digital archaeology sits outside of these consensus-led principles. As a dedicated practice, it is too recent to be mentioned in most codes of ethics as written for professional membership organizations. Moreover, it is too much of a specialty within the discipline to be specified in most codes of ethics for commercial endeavors. This has led to digital archaeology operating in an ethical limbo, wherein practitioners have clear expectations of how the conventional (hereafter referred to as analog) archaeological aspects of their work should be considered in terms of ethics, but are largely left to their own devices as regards ethical decision-making for the specifically digital portions of their work.

As a result of these lapses, digital archaeology has advanced beyond a methodological approach to become a sub-discipline within archaeology that is existing almost entirely without ethical oversight. The blame for this should be accepted by the whole of the discipline. Determining what constitutes ethical consensus on work with digital tools and digital methodologies should not rest entirely on the shoulders of those who label themselves digital archaeologists. Digital archaeology

has evolved to contain its own work and has expanded into mainstream geographical and temporally-focused archaeology, and the ethics of practice of that evolution, and that expansion, have not kept up with growth.

One of the first published mentions of what would become 'digital' archaeology occurred in Chenhall's (1967) discussion of the electronic computer as a tool for data storage and retrieval. Cowgill's (1967) discussion of the introduction of computers for statistical and computational analysis followed later that year. This was followed by extensive arguments for and against the use of computers in archaeology throughout the 1970s and an explosion of computer-mediated archaeological data production in the 1980s. By 1992 the concept of a digital archaeology and dedicated digital archaeologists had become widespread enough to support the founding of the Computer Applications in Archaeology (CAA) organization. The Society of American Archaeology's (SAA) Digital Archaeology Interest group followed shortly after. It was not until 2003 that the first explicit mention of ethics in digital archaeology was published (Bayliss 2003). Even then, CAA did not have a dedicated ethics policy for digital archaeology until 2018 (CAA 2018), and SAA and EAA (as of this writing) still do not.

Many of the issues from digital archaeology's early days are still unresolved. This article discusses three areas in which digital archaeologists are failing (or are being failed by archaeology in general) in establishing clear ethical guidance. The first of these areas is related to technology and digital tool usage, and is included to reference the sector conceptions of digital archaeological methods as

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tools, not unlike the trowel and plane table. The second of these areas is related to methodological rigor and research design, and is included to reference digital archaeology's place in wider archaeological theory. The third of these areas is related to pedagogical choices in teaching the next generation (and the first potentially wholly digital generation) of archaeologists. While there are other areas of potential ethical consideration, these three have been selected to show the wide range of conceptions of the digital within archaeology, and indicate a lack of consensus on how digital archaeology should be viewed, and how it should be considered ethically.

2. Current state of ethical affairs

Within archaeology, ethics is customarily encountered via one of two overarching circumstances: the practical need to meet compliance with a university or research body mandated ethics framework, and the peer-led need to meet compliance with established standards of professional membership organizations. The function of each of these areas is radically different.

While the former requires an official submission of practical ethical impact for review, the concerns of universities and research bodies who control such reviews lie within a neoliberal manifestation of corporatized responsibility: the duty of care to participants is more often accomplished through a process that presents as professional accountability, but is in reality an attempt to deflect liability away from organizations and onto individual researchers. (This process often results in a conflation of meeting an ethical mandate with meeting a legal mandate.)

In contrast, professional membership bodies rarely require an official submission of ethics considerations from members to disseminate or present research (CAA being a recent exception), fundamentally relying on universities and research funding bodies to make sure that the work of compliance is undertaken. Guidelines for ethical practice are presented, and members are encouraged to negotiate the generalized statements independently in light of the particulars of their own practice. The majority of professional organizations for archaeologists ask members to follow what are known as 'aspirational' codes of ethics.

Aspirational codes of ethics are intentionally generalist and may be framed as 'principles', as their intent is not to proscribe behavior but to 'define general and fundamental propositions that affirm the tenets of the profession, which can be adopted to guide action in a wide variety of specific settings' (Colwell-Chanthaphonh and Ferguson 2006: 116–117). Failure to comply with an organization's code of ethics has few, if any, consequences under an aspirational system, and while an organization's ethics committee may be asked to weigh-in on reported complaints, in the context of archaeology and aspirational code violations there is almost never a mechanism for consequence.

In contrast, 'prescriptive' codes of ethics are more akin to a rules-based system. A prescriptive code of ethics specifically sets out statements related to acceptable and unacceptable behaviors within an organization. As an example, the *Code of Conduct and Standards of Research Performance* of the Register of Professional Archaeologists is deliberately prescriptive, listing what an archaeologist

'shall' and 'shall not' do (RPA 2018). These standards are enforced via a grievance process, which is overseen by an elected officer whose role is to handle 'allegations of violations of the Code of Conduct and Standards of Research Performance of the Register, in accordance with the Disciplinary Procedures of the Register' (RPA 2018).

In the past such prescriptive policies were more likely to be referred to as codes of conduct. Of late within archaeology, however, calling such documents codes of conduct has become a potentially confusing misnomer. Recent social justice movements calling out harassment (sexual and otherwise) and inappropriate interpersonal behaviors within the academy and within research environments have resulted in the development of new codes of conduct for several archaeological organizations (Hawkins and Reeds 2018; SHA 2018; TRAC 2018), and these official practical policies sit alongside previously existing codes (or 'principles') of ethics.

That said, within archaeology there is an historically accepted belief that ethical behavior should flow from an archaeologist's participation in such professional membership societies, and that the field should set its own consensus-based standards of acceptable and unacceptable practice. Aspirational codes of ethics typically fulfill this role. What is stressed in such guidelines is the duty of the practitioner in their ethical choices to the discipline or to the (amorphously conceptual) archaeological record. The consequences of the archaeologist's actions are rarely, if ever, the focus. For example, SAA's Principle No. 1 calls for archaeologists to, 'work for the long-term conservation and protection of the archaeological record by practicing and promoting stewardship of the archaeological record' (SAA 1996). How this is to be accomplished, what metrics should be used to measure effectiveness, and mostly importantly what should happen if the archaeologist fails to 'practice and promote stewardship' are not addressed. A comparably aspirational guideline can be found in SHA's Principle 2, in which in archaeologists have, 'a duty to encourage and support the long-term preservation and effective management of archaeological sites and collections…for the benefit of humanity' (SHA 2015). Again, the archaeologist is asked to fulfill a duty without any considerations for what happens if they do not. Such ethical guidelines are purposefully vague, allowing for applicability within multiple areas of sub-disciplinary practice and varying world-wide standards of cultural acceptability.

As a result of this system of consensus, archaeologists are asked to consider their choices in research, in the field, and in analyses in light of whether those choices meet the moral standards established in membership-based codes of ethics. The guidelines within these codes of ethics represent the collection of archaeological consensuses on ethical appropriateness, and while there is variation between professional organizations, at their broadest codes typically include guidelines on stakeholders, material culture, curation, behavioral standards, research practices, and data collection (Dennis 2019).

Two questions arise in light of these generalized standards. First, are the guidelines within membership codes, as written, appropriate for utilization in digital archaeology? And second, are those codes addressing all the areas of

ethical concern in which digital archaeologists are functioning? The simple answer to those questions is no, as digital archaeologists as practitioners are barely addressed within published discussions of archaeological ethics. The more complex answer is still no, but requires consideration not just of the presence or absence of references to the digital in written codes of ethics, but also of the transition from analog to digital tools, paper to virtual methodologies, and the theoretical positioning of the digital as practice, method, or specialization.

3. Particulars of digital archaeological ethics

For the purposes of this analysis, digital archaeology is defined as archaeology largely or exclusively facilitated through computer-based tools or analytical approaches, or archaeology concerned with virtual or digital representations of space or materiality, or archaeology concerned with information technology or internet-based data sources. Via a Google Scholar-based literature search of peer-reviewed publications produced from 2010 to 2018 that were explicitly concerned with archaeological ethics, less than 30 mentioned digital archaeology directly. Of peer-reviewed publications from 2010 to 2018 that were explicitly concerned with (as previously defined) digital archaeology, less than 20 mentioned ethics directly.

Within both sets of publications, key areas otherwise addressed in non-digital archaeological ethics are omitted. For example, stewardship has been mentioned by Hamilakis and Duke (2016), Watkins (2015), and Groarke and Warrick (2006), but it is missing from digitally focused discussions. Hollowell and Nicholas (2007; 2008) have written extensively on postcoloniality and decoloniality in archaeology, but not from a digital perspective. The closest analogue in this area is through the concept of 'digital repatriation' (DeHass and Taitt: 2018, 121).

In light of this general lack of publication, it should not be surprising that a similar gap exists in guidance provided to members by professional archaeological organizations. Of the professional membership bodies for archaeologists with international scope, currently CAA is the only organization with an ethics policy that speaks to digital archaeology directly, with guidelines designed specifically to address ethical issues commonly confronted in digital practice (CAA 2018). Other international archaeological organizations, such as EAA, address digital archaeology obliquely through mentions of digital data retention (EAA 2009), or not at all, as is the case with SAA (1996) wherein digital archaeologists are placed entirely (and invisibly) within the overall discipline.

These reductions and omissions impact more than just those who consider themselves functionally digital archaeologists. They imply through their absence that there are no ethical concerns inherent in digital work undertaken by those archaeologists who situate themselves in traditionally geographically or temporally associated archaeological areas of research. However, if only those members of the discipline who are subject to the CAA's code of ethics are being asked to adhere to consensus-based codes regarding digital archaeology, then the majority of archaeologists using digital tools and methods are working without full ethical oversight in the sense of ethics as community consensus. In any other ethical area than the digital, this would be considered unacceptable practice.

4. The black box of digital archaeology

The first area in which digital archaeology is operating without consensus-led ethical guidelines is in the use of digital technology and digital tool usage. In effect, much of digital archaeology as undertaken by both dedicated practitioners and more casual users operates using what are referred to as 'black box' technologies or methods. The concept of a black box in archaeology has been discussed extensively via discussions of Latour (1987), and more recently and applicably by Huggett (2017) and Caraher (2016: 434). Caraher explains its use in digital archaeology as the result of:

> '...growing pressures on both academic archaeologists and those in the field of cultural resource management to produce results at the pace of development and capital. In other words, as digital tools accelerate the pace of archaeological work, more aspects of archaeological practice become obscured by technology.' (Caraher 2016: 434).

Some potentially black box technologies and methods in use within archaeology include digital photography, geographic information systems and spatial mapping software, and photogrammetric rendering. The ubiquity of digital tools and methodologies in the most mainstream of archaeologies has led to a mass of digitally extracted data and digitally produced analyses, many of which are facilitated through the use of proprietary software and tool packages such as Adobe Photoshop, ArcGIS, and Agisoft PhotoScan. Even those analyses resulting from the use of open source software packages, for example QGIS, are on the whole utilized without a full grasp of the data processes and algorithms underpinning the processes of those packages. Packages such as R, and packages that require programming in Python, often entail further potential black-boxing through their reliance on external code libraries.

For example, digital photography in the context of site or artifact photography can be of ethical concern in the sense of its operation as a black box. This occurs both through the use of secondary editing software, and more crucially, through hidden image enhancement that takes place within the camera itself. Some filters emphasize and de-emphasize areas of light and shadow, features of linearity, and levels of detail to the extent that the archaeologist utilizing digitally filtered photographs can potentially be adding, removing, and impacting data without intending to do so. What is more difficult to mitigate are features built into modern digital cameras such as digital sensors and built-in software that shapes the photographic process. This software is not open source, and sensors are controlled by proprietary processes that make it virtually impossible, short of tearing down the camera, to fully control how the photograph is being captured. Digitally edited photographs, however, have come to be accepted within archaeology without consideration of such an

ethical issue, and the advent of digital data repositories means that it is more likely than not that digitally produced and edited photographs are what the majority of the record going forward will consist of. Even considering the taking of a photograph to be an inherently biased act, the further process of digital editing goes beyond adding a human lens of subjectivity to adding a secondary (largely impenetrable) algorithmic lens.

On an equally enduring level, the use of black boxed technologies has learning and pedagogical implications in archaeological education in higher education environments. The education of new archaeologists into the discipline increasingly relies on the use of digital tools for what were previously analog practices. As an example, teaching students to conduct aspects of field survey with digital tools often fails to rest on a foundation of full understanding of the reasons for the use of those tools. Instead of a way to consider the data being collected as it is being collected, the tools become merely a relatively quick step to be taken to analyze data later. As a result, 'complex algorithms are activated with a simple click that requires little or no knowledge of what is actually done to the data' (Kvamme 2018: 75). This results in students being unprepared for situations in which high-end equipment is unavailable, as well as being unable to understand where they (and their biases, and their background, and their ethical choices) stand as an actor in the process of data production. There is a double ethical failure: students may present themselves as possessing expertise that is not founded in understanding, and educators are failing to display what expertise consists of, allowing for misrepresentation.

Beyond the problem of potentially flawed analyses, this reliance on black boxes raises concerns as to how archaeologists are allowing the unseen aspects of these processes to influence their ethical decision making. The creation of research designs that rely on black box technologies cannot effectively address whether those designs are meeting the ethical standards agreed upon by consensus within archaeology as a field. By its very nature, if a system cannot be understood by its user, then its user cannot ensure that a formalized ethical compliance is being met, let alone if an aspirational ethical standard is being met. This black box problem is not unique to archaeology: discussions of a similar nature are taking place in other fields that have seen a rapid growth in digital methods (e.g. Hynes 2018). What makes archaeology different in its use of digital methods related to human populations is that in the majority of archaeological cases there is no way to verify results obtained from digital methods when black boxes are employed. The fundamental data for analysis has been transformed from physical to digitally virtual, with an unknown amount of change or loss. This provides little to no chance of replicability in data collection due to archaeological excavation's inherently destructive nature.

5. Research design and methodological choices

The second area in which ethics are underemployed is in the integration of digital tools and the implementation of digital methodologies in research designs. There are two related ways in which this failure stands to harm the discipline. The first is concerned with how digital tools and methodologies are being chosen for use in research designs, and the second is concerned with how digital archaeology is, and is not, meeting ethical obligations to marginalized, historically ill-treated, and indigenous populations.

The utilization of digital tools and methods within an archaeological project should be considered from the outset of the project, and should be subject to the same level of ethical scrutiny as the use of any toolset or methodological approach. A series of simple questions asked at the beginning of research design planning may result in the addition, or elimination, of digital aspects of the project. For every tool, the question should be asked: 'Is the use of this tool in a digital form adding value to the project that is balanced by the ethics of its use?' For every methodological choice, the question should be asked: 'Is this approach, mediated digitally, fulfilling all of our needs for it, without adding undue ethical burden or breach?' If the answer to either of those questions is no, the use of the digital form should be weighed against the analog form. Just because something can be accomplished faster, or easier, with a digital approach does not mean that the ethics of that approach are equal. Understanding the ethical burden borne by methodological and practical choices is the responsibility of every archaeologist, as the ethical burden of a particular tool, or a particular methodology will differ, often situationally.

As an example within digital archaeology, the digitization of images of human remains and the storage of data related to human remains is one of the few areas that has seen extensive discussion. A special issue of *Archaeologies* has recently approached the topic (Alfonso-Durruty et al. 2018; Hassett et al. 2018; Hirst, White & Smith 2018; Ulguim 2018; White, Hirst & Smith 2018) and together with an article by Williams and Atkin (2015) demonstrates a disciplinary concern with how osteological data are being transmitted digitally. For the most part though, these discussions have been centered in a transitional framework: how will osteoarchaeology and related areas meet the ethical standards of physical practice in a newly digital world? They have not considered the differences inherent in born-digital osteoarchaeological work, or the potential differences in views towards digital permanence by indigenous populations and marginalized populations. As yet, no widespread study on how indigenous groups view their rights in digitally mediated archaeology has been undertaken within archaeology itself, though related work within anthropology and cultural heritage projects hints at what such views might be. Without this input, the ethics of practice for digital archaeology related to human remains is being determined by practicing (largely non-indigenous) archaeologists and through conjecture from related fields. This is a colonialist approach that explicitly stands in opposition to the consensus-based codes of ethics that make up archaeology's aspirational disciplinary standard. The exclusion of indigenous populations from these discussions and the omission of their input mirrors past practices in archaeology that have been previously determined to be ethically unsound, belonging to a past age.

While it is almost certain that varying indigenous groups will have different opinions on how digital tools, methodologies, and systems of digital storage should be applied (and not applied) to data derived from their cultural forbearers, this potential variance should not in itself stand in the way of attempting to achieve ethical consensus. Instead, the relative youth of digital archaeology should be viewed as an opportunity to create partnerships and relationships between archaeologists and their non-archaeologist collaborators that are, from the outset, grounded in shared values and respect and directed by community desires and rights.

6. Education, pedagogy, and student focused resources

A third area in which digital archaeologists are failing, and being failed, in terms of ethics concerns how higher education is preparing students for the digitally mediated future of archaeological practice, as, 'a robust theoretical and methodological framework for digital archaeological pedagogy remains to be developed' (Alcock, Dufton & Durusu-Tanrıöver 2016: 5). This failure of ethics comes in two forms. First, archaeologists are often teaching students to use digital tools without teaching the accompanying ethical consideration of those tools. Second, students are often being asked to be performative with digital tools and in the use of digital methodologies without regard for the ethics or the implications of that performative behavior.

Aside from the issues of attainment of expertise with digital archaeological tools discussed above, students are also failing to be educated in a process of ethical questioning concerning their digital outputs. There are few peer-reviewed pedagogical discussions around teaching digital ethics to archaeology students. Instead, students are frequently taught that software and hardware usage should be approached as the manipulation of technical tools, and not as choices to be made with attendant ethical ramifications. Exceptions to this include the work of Perry (2018), on humanizing digital archaeological and heritage practice, Graham (2016) on creating digital humanities notebooks and digital creation in the classroom, and the collective work of participants in the Michigan State University Institute on Digital Archaeology Method & Practice (MSUDAI 2015) on collaborative cohorts in digital archaeological projects. Also notable is Cook's work with students on creating ethically grounded digital exhibitions for museum contexts (Cook 2018). Similarly, teaching from a digital database allows for direct mapping of teaching onto 'several of the Society for American Archaeology's Principles of Archaeological Ethics—namely, Stewardship, Records and Preservation, and Training and Resources' (Agbe-Davis et al. 2014: 856), although this is an argument focused on the use of a digital data source.

The second issue concerning the education of students in digital archaeological ethics involves performative outputs in archaeological education. As familiarity with digital tools disseminates into undergraduate education, students are increasingly being asked to pair their learning with publicly facing portfolios of practice and product. The reflection asked for in these portfolios is intended to influence student understanding of the nature of the inherently public work of archaeology, and to provide students with the chance to express their process and their learning as a journey. The ethical issue, however, is that students are being asked to engage in this performative output without evidence of consideration for their own professional digital footprint, and without a full understanding of digital remembrance and the power of internet memory. The question of whether what we are asking students to reflect on via criticality is as apparent to the public as it is apparent to academics (Richardson 2018: 67) should be considered more fully when using public performance as an educational practice.

As the first generation of born-digital participants and wide-spread contributory internet users is coming of age in the workforce, choices made in the past, including language usage, political opinions, social values, and associations, are visibly available to employers and the public in a way never before experienced (Cooley and Parks-Yancy 2016). In effect, 'social media activities can create a negative, publicly accessible digital footprint that can detrimentally impact an individual's current prospects and future careers' (Buchanan et al. 2016). Students of archaeology training to be near-future professionals will one day soon have to account for the digital outputs related to their educational growth if those outputs are performative. The ethical consideration of platform choice on the part of educators, and the option to opt-out of public presentations of reflective work can help to mitigate potential future problems.

By its very nature, the reflection undertaken in an educationally-mandated output should not be required to be publicly performative in perpetuity, if the goal of the reflection is to refine and change attitudes towards topics encountered in the course of that education, meaning that by the end of the experience, students may feel differently than they did at the beginning. The digital record, however, holds and preserves the early impressions of performative experiences in archaeological education where they may be removed from the overall context of iterative learning and left contextless, and harmful to professional opportunities. While the educator facilitating such an exercise may be appropriately managing their duty of care during the course of the reflective period, there is a failure of duty of care in requiring students to be performative in such a way that that care is removed when the course is over, but the performative output remains public.

In light of this situation, educators should consider whether the public-facing portion of the reflective piece in their teaching is necessary, or whether similar impacts could be achieved without mandating public performance. Perry addressed the former via reflective interviews with students who had been engaged in the course of their education with performative blogging in digital archaeology and heritage, making the argument that digital engagement through blogging is a means of 'honing new practitioners who are conscious of their implication in knowledge production in the present, and of the ethical and intellectual imperatives that come with such privilege' (Perry 2015). This sentiment was echoed generally by Brock and Goldstein (2015), who approach performative blogging in archaeological field schools as an aspect of a

constructivist approach; not only as a place for physical training in the discipline, but as a training ground for engaging in public and digital methods such that:

> '…the public and digital archaeology skills the students learn follow the same pedagogical framework. This was achieved by making the blog publicly available, so that the posts written by students would be read by actual stakeholders. This placed students in the real-world context of discussing archaeology with an actual digital public, not simply with their professors and classmates.' (Brock and Goldstein 2015).

Though these particular outputs were demonstrably managed with an eye towards duty of care towards students, and while they served as instructive educational experiences, there is an argument to be made for setting cut-off dates for how long such outputs are available to the public after their participants have concluded their active participation. Students in digital archaeology who are required to be publicly performative should have a say in the planned obsolescence or future mediation of their reflections through a predetermined cut-off date for public access to those reflections, or through the ability to return to them publicly at a later date to refute or recontextualize their impact.

As educators strive to be more ethical in their approaches to digital archaeology, there is a need to see the increased development of usable resources to facilitate the process, and provide extensions to learning. But who should be the intended audience for such resources? While existing resources such as the Archaeological Ethics Database, a searchable database of peer-reviewed articles, non-peer reviewed blogs, and syllabi related to archaeological ethics (RPA/CIfA 2018) provide opportunities to showcase how ethics are being approached via course and module syllabi, these collected resources are not presented in a student-oriented format, and are not designed in their aggregate to provide students with knowledge of digital archaeological ethics. Nor are they clearly intended for those teaching students. Of the (at the time of writing) 28 sources that are tagged as relating to digital ethics within the Archaeological Ethics Database, none explicitly discuss digital archaeology in the context of pedagogical development, and only two are syllabi, with one of those an inactive link without guidance as to the continuing status of the module (RPA/CIfA 2018).

While graduate students often find themselves confronting the ethics of their practice through mandated submission to ethical review boards, that is typically the first time that students encounter ethics in archaeology, and as digital archaeology is often seen to have no 'participants' that may be harmed those students engaged in digital archaeology may find themselves failing to engage with ethical review processes even then. Increased attention focused on undergraduate and beginning graduate student-level interactions with ethics in digital archaeology, combined with an increased focus on the ethics of digital archaeology among those tasked with teaching students, and an accompanying set of resources geared towards that audience, would go a long way towards alleviating the problems caused by the previously mentioned gaps. Currently, resources for teaching professionals and students related to digital archaeological ethics are not being provided, even with the advent of an otherwise admirable joint endeavor between the Register of Professional Archaeologists and the Chartered Institute for Archaeologists to share resources on ethical archaeologies.

7. Conclusion: next steps in the ethical practice of digital archaeology

Remediating the gaps in how digital archaeological ethics are being addressed is possible. It is not outside of the realm of archaeology as a discipline to deal with these problems and to determine effective, implementable solutions. Several simple steps could serve to increase ethical rigor in digital archaeology, and allow specialized practitioners and more general users of digital archaeological methods and tools to operate within consensus-led frameworks of ethical decision making.

First, archaeologists should consider whether the professional organizations in which they maintain memberships are addressing the ethical situations that they find themselves in as digital archaeologists. If the aspirational codes of ethics of these organizations were applied directly to a context of digital archaeology, would there be areas where the archaeologist found themselves working without guidance or with less than adequate guidance? If, as asserted previously, the majority of aspirational codes of ethics fail in this regard, how relevant is membership of a society if the aspirational codes of that society do not provide guidance? How valid is an organization if its consensus-led ethical considerations do not represent all their members? Is the validity of that organization as a representative body suspect?

Second, digital tools and methodologies should be considered as discrete parts of the archaeological toolkit when creating research designs, and should be subject to the same level of ethical scrutiny as any standard or traditional piece of kit or methodological approach. Archaeologists should consider whether their use of a digital tool or methodology is ethically appropriate, and whether the use of that tool or method is replicating a colonialist mindset in archaeology or otherwise acting against consensus-led standards of archaeological ethics. The use of a digital tool or method just because it is digital is not ethical scholarship. The use of a digital tool that cannot be understood by the user, or a digital method whose analytic processes cannot be explained by the user, is an inherently unethical choice.

Third, how data is shifting from a paper and materially-based archive to digital forms of curation is an ethical issue for archaeology in general, but beyond that, how that digital data relates to living peoples also requires consideration. The processes of exercising a duty of care to marginalized and historically ill-treated populations becomes more complicated when digital communications and practices are involved. The assumption that the same ethical practices would apply in digital venues as in trowel-to-ground excavations or face-to-face ethnographic

data collection is false, as there are additional issues to consider in the digital. Indigenous peoples especially stand to be harmed as colonizer-created data is distributed online and stored in inaccessible data repositories out of their control.

Fourth, and finally, how digital archaeology is being taught, and how the ethics of that digital archaeology are being inculcated in students of archaeology, needs addressing for its implications on the future of the discipline. While teaching students the tools to operate fully within an increasingly digitally situated archaeology is necessary, without accompanying training on the ethical implications of the digital tools and of the changes that come to archaeology through their use, students are being ill-prepared for the realities of working in a sector that by its very nature has ethical obligations to multiple publics. Alongside this, students are often being asked to be publicly performative during their learning process, in the process creating a digital footprint that is attached to their name and future professional reputation during a period of their formative development as archaeologists. These students require additional resources (in the form of case studies, collected examples of good practice, and exercises that promote decoloniality and community-led projects) geared towards their engagement with archaeology as a digital endeavor, and educators require a considered focus on pedagogical practice related to digital archaeology and the ethics of their choices as educators.

These four changes, as part of a larger questioning as to how digital archaeology fits into the discipline as a whole, could serve to impact both current and future practice. By taking stock of, and considering how the consensus-led ethics that we have been operating under are applicable and non-applicable to digital archaeology, there is time to direct tool usage, methodology, public engagement, and pedagogy to create the ethical digital archaeology that we want as a discipline.

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Competing Interests

L. Meghan Dennis is currently a co-opted Ethics Officer on the CAA International Steering Committee and served previously as a member of the SAA Committee on Ethics. Both are voluntary positions.

References

Agbe-Davies, AS, Galle, JE, Hauser, MW and **Neiman, FD.** 2014. Teaching with digital archaeological data: A research archive in the university classroom. *Journal of Archaeological Method and Theory*, 21(4): 837–861. DOI: https://doi.org/10.1007/s10816-013-9178-3

Alcock, SE, Dufton, JA and **Durusu-Tanrıöver, M.** 2016. Archaeology and the MOOC: Massive, open, online, and opportunistic. *Journal of Social Archaeology*, 16(1): 3–31. DOI: https://doi.org/10.1177/1469605315609017

Alfonso-Durruty, M, Morello, F, Misarti, N, Vilar, MG and **Headley, D.** 2018. Protocol, Potentials, and Limitations of Ancient Teeth 3D Printing. *Archaeologies*, 14(2): 299–316. DOI: https://doi.org/10.1007/s11759-018-9345-y

Bayliss, R. 2003. Archaeological survey and visualisation: the view from Byzantium. *Late Antique Archaeology*, 1(1): 26–313. DOI: https://doi.org/10.1163/22134522-90000012

Brock, TP and **Goldstein, L.** 2015. Blogging the Field School: Teaching Digital Public Archaeology. *Internet Archaeology*, 39. DOI: https://doi.org/10.11141/ia.39.8

Buchanan, R, Scevak, J, Smith, SP and **Southgate, E.** 2016. What do students understand about digital footprint management? Examining social media education for career guidance. In: *The Australian Association for Research in Education conference (AARE)*, November 27–Dec 1 2016, Melbourne. Available at: https://www.researchgate.net/publication/314246323_What_do_students_understand_about_digital_footprint_management_Examining_social_media_education_for_career_guidance [Last accessed 29 April 2020].

Caraher, W. 2016. Slow archaeology: technology, efficiency, and archaeological work. In: Averett, EW, Gordon, JM and Counts, DB (eds.), *Mobilizing the Past for a Digital Future: The Potential of Digital Archaeology*. Grand Forks: The Digital Press @ The University of North Dakota, pp. 421–41. DOI: https://doi.org/10.17613/M6ZG8P

Chenhall, R. 1967. The Description of Archaeological Data in Computer Language, *American Antiquity*, 32(2): 161–167. DOI: https://doi.org/10.2307/277901

Colwell-Chanthaphonh, C and **Ferguson, TJ.** 2006. Trust and archaeological practice: towards a framework of virtue ethics. In: Scarre, C and Scarre, G (eds.), *The ethics of archaeology: philosophical perspectives on archaeological practice*. Cambridge: Cambridge University Press, pp. 115–130. DOI: https://doi.org/10.1017/CBO9780511817656.007

Computer Applications & Quantitative Methods in Archaeology (CAA). 2018. *Ethics Policy*. Available at: https://caa-international.org/about/ethics-policy/ [Last accessed 29 April 2020].

Cook, K. 2018. Hacking Classrooms for Communities: Augmenting Collaboration Through Digital Scholarship. In: Hageneuer, S (ed.), *Communicating the Past in the Digital Age*: *Proceedings of the International*

Conference on Digital Methods in Teaching and Learning in Archaeology. London: Ubiquity Press, pp. 115–126. DOI: https://doi.org/10.5334/bch

Cooley, D and **Parks-Yancy, R.** 2016. Impact of traditional and internet/social media screening mechanisms on employers' perceptions of job applicants. *The Journal of Social Media in Society*, 5(3): 151–186.

Cowgill, GL. 1967. Computer applications in archaeology. *Proceedings of the November 14–16, 1967, fall joint computer conference (AFIPS '67)*, 331–337. DOI: https://doi.org/10.1145/1465611.1465654

DeHass, MKC and **Taitt, A.** 2018. 3D Technology in Collaborative Heritage Preservation. *Museum Anthropology Review*, 12(2): 120–152. DOI: https://doi.org/10.14434/mar.v12i2.22428

Dennis, LM. 2019. Archaeological Ethics, Video-Games, and Digital Archaeology: A Qualitative Study on Impacts and Intersections. Unpublished thesis (PhD), University of York.

European Association of Archaeologists (EAA). 2009. *EAA Codes and Principles*. Available at: https://www.e-a-a.org/EAA/About/EAA_Codes/EAA/Navigation_About/EAA_Codes.aspx [Last accessed 29 April 29, 2020].

Graham, S. 2016. Shawn Graham's Open Digital Humanities Notebook 2016–17. Available at: https://ir.library.carleton.ca/pub/14187 [Last accessed 29 April 29, 2020].

Groarke, L and **Warrick, G.** 2006. Stewardship gone astray? Ethics and the SAA. In: Scarre, C and Scarre, G (eds.), *The Ethics of Archaeology: Philosophical Perspectives on Archaeological Practice*. Cambridge: Cambridge University Press, pp. 163–180. DOI: https://doi.org/10.1017/CBO9780511817656.010

Hassett, BR, Rando, C, Bocaege, E, Durruty, MA, Hirst, C, Smith, S, Ulguim, PF, White, S and **Wilson, A.** 2018. Transcript of WAC 8 Digital Bioarchaeological Ethics Panel Discussion, 29 August 2016 and Resolution on Ethical Use of Digital Bioarchaeological Data. *Archaeologies*, 14(2): 1–21. DOI: https://doi.org/10.1007/s11759-018-9343-0

Hawkins, K and **Rees, C.** 2018. *RESPECT: Acting Against Harassment in Archaeology, BAJR Guide 44*. Available at: http://www.bajr.org/BAJRGuides/44.%20Harrasment/Sexual-Harassment-in-Archaeology.pdf [Last accessed 29 April 2020].

Hirst, CS, White, S and **Smith, SE.** 2018. Standardisation in 3D Geometric Morphometrics: Ethics, Ownership, and Methods. *Archaeologies*, 14(2): 272–298. DOI: https://doi.org/10.1007/s11759-018-9349-7

Hollowell, J and **Nicholas, G.** 2007. Ethical challenges to a postcolonial archaeology: The legacy of scientific colonialism. In: Hamilakis, Y and Duke, P (eds.), *Archaeology and Capitalism: From Ethics to Politics*. Walnut Creek, CA: Left Coast Press, pp. 59–82.

Hollowell, J and **Nicholas, G.** 2008. A critical assessment of ethnography in archaeology. In: Castañeda, QE and Matthews, CN (eds.), *Ethnographic Archaeologies: Reflections on Stakeholders and Archaeological Practices*. Lanham, MD: Altamira Press, pp. 63–94.

Huggett, J. 2017. The Apparatus of Digital Archaeology, *Internet Archaeology*, 44. DOI: https://doi.org/10.11141/ia.44.7

Hynes, M. 2018. Shining a brighter light into the digital 'black box': A call for stronger sociological (re)engagement with digital technology design, development and adoption debates. *Irish Journal of Sociology*, 26(1): 94–126. DOI: https://doi.org/10.1177/0791603517741605

Kvamme, K. 2018. Getting Around the Black Box: Teaching (Geophysical) Data Processing through GIS. *Journal of Computer Applications in Archaeology*, 1(1): 74–87. DOI: https://doi.org/10.5334/jcaa.14

Latour, B. 1987. *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge: Harvard University Press.

Michigan State University Institute on Digital Archaeology Method & Practice (MSUDAI). 2015. *The Institute on Digital Archaeology Method & Practice*. Available at: http://digitalarchaeology.msu.edu/ [Last accessed 29 April 29, 2020].

Perry, S. 2015. Changing the Way Archaeologists Work: blogging and the development of expertise. *Internet Archaeology*, 39. DOI: https://doi.org/10.11141/ia.39.9

Perry, S. 2018. Why are Heritage Interpreters Voiceless at the Trowel's Edge? A Plea for Rewriting the Archaeological Workflow. *Advances in Archaeological Practice*, 6(3): 212–227 DOI: https://doi.org/10.1017/aap.2018.21

Register of Professional Archaeologists (RPA). 2018. *Code of Conduct and Standards of Research Performance*. Available at: https://rpanet.org/wp-content/uploads/2019/03/Register-Code.pdf [Last accessed 29 April 29, 2020].

Register of Professional Archaeologists and the Chartered Institute for Archaeologists (RPA/CIfA). 2018. *Archaeological Ethics Database*. Available at: http://archaeologicalethics.org/ [Last accessed 29 April 2020].

Richardson, LJ. 2018. Ethical challenges in digital public archaeology. *Journal of Computer Applications in Archaeology*, 1(1): 64–73. DOI: https://doi.org/10.5334/jcaa.13

Society for American Archaeology (SAA). 1996. Principles of Archaeological Ethics. Available at: https://www.saa.org/career-practice/ethics-in-professional-archaeology [Last accessed 29 April 2020].

Society for Historical Archaeology (SHA). 2015. *SHA Ethics Principles*. Available at: https://sha.org/about-us/ethics-statement/ [Last accessed 29 April 2020].

Society for Historical Archaeology (SHA). 2018. *SHA Sexual Harassment and Discrimination Policy*. Available at: https://sha.org/about-us/sha-sexual-harassment-discrimination-policy/ [Last accessed 29 April 2020].

Theoretical Roman Archaeology Conference (TRAC). 2018. *TRAC Conduct Policy*. Available at: http://trac.

org.uk/about/trac-conduct-policy/ [Last accessed 29 April 2020].

Ulguim, P. 2018. Models and Metadata: The Ethics of Sharing Bioarchaeological 3D Models Online. *Archaeologies*, 14(2): 189–228. DOI: https://doi.org/10.1007/s11759-018-9346-x

Watkins, J. 2015. An Indigenous Anthropologist's Perspective on Archaeological Ethics. In: Gnecco, C and Lippert, D (eds.), *Ethics and Archaeological Praxis.*

New York, NY: Springer, pp. 21–26. DOI: https://doi.org/10.1007/978-1-4939-1646-7_2

White, S, Hirst, C and **Smith, SE.** 2018. The Suitability of 3D Data: 3D Digitisation of Human Remains. *Archaeologies*, 14(2): 250–271. DOI: https://doi.org/10.1007/s11759-018-9347-9

Williams, H and **Atkin, A.** 2015 Virtually Dead: Digital Public Mortuary Archaeology. *Internet Archaeology*, 40. DOI: https://doi.org/10.11141/ia.40.7.4