# DIGITAL ARCHAEOLOGY
## Promises and Impasses

51

ANALECTA
PRAEHISTORICA
LEIDENSIA

edited by
TUNA KALAYCI, KARSTEN LAMBERS
& VICTOR KLINKENBERG

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# Metaphors, Myths, and Transformations in Digital Archaeology

Tuna Kalaycı and Piraye Hacıgüzeller

## 1 Introduction

"We are *all* digital archaeologists" (Morgan and Eve 2012, 523, emphasis in original). The digitalization of archaeological practice has indeed been more visible in recent years[1]. Even on a day with little computation needs, we work on a variety of scholarly tasks. Typing in a word processor, sharing files in the cloud, browsing an online atlas, sending e-mails, and teaching on platforms are only to name a few.

Yet, as early as the 50's, Gardin was asking, "[c]an one resolve-or partially resolve […] difficulties by the construction of standard categories that are relatively culture-free and by the use of mechanical aids such as systems of punch-card indices?" (1958, 335). This is the age-old categorisation problem, though we are (seemingly) less coerced by the 'culture-free' -ness doctrine. In 1962, "the use of computers in anthropology" symposium was organized (Hymes 1963). In 1973, the first conference on Computer Applications in Archaeology (CAA) brought together the pioneers. By the 1980s, colleagues were already experimenting with the first modern remote sensor technologies (Custer *et al.* 1986). The Center for the Study of Architecture published the CSA Newsletter on early digital technologies in 1988… moving fast-forward to the current day; one can access high-performance computing (HPC) over the internet, a power probably unimaginable to achieve not so long ago. We admittedly provide a simple-linear historical narrative hereby. However, a more detailed and inclusive history would have probably still pointed at early digital archaeologists -less visible and fewer in number than today; in the 21st century we are finally all digital (Morgan and Eve 2012).

As we make digital transformations, current computational advancements are increasingly promising that we can -once again- *push the envelope* using *cutting-edge* tools and technologies and move *beyond state of the art*. The most recent innovation, Artificial Intelligence (AI), is now famously called "the new

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1 We acknowledge that computation is a new signifier as analogue computation has been known to the archaeologist for some time (*e.g.*, Antikythera mechanism – 2nd century BC, or al-Jazari's classic automatons – 12th century CE). Computers predate the digital, and can be even biological. Women were called "computers" (Light 1999), setting the stage for modern-day routines and algorithms as they laboriously performed computation by hand. As we cruise our way in the complex socio-technical history, we use the terms computation and digital interchangeably. Overall, we consider "digital archaeology" an umbrella term that encompasses everyday-life activities. To us, "computational archaeology" suggests codes, simulations, GIS models, machine learning, or many similar techniques, which require more training and experimentation with digital computers.

electricity" (Lynch 2017). AI changes the way people compute; it is a move away from theory building and modelling and is a step towards a data-driven reading of the world. While the current artificial intelligence boom is everywhere, from law to medicine and from archaeology to astronomy, the innovation[2] has been making periodic appearances in the academic landscape since the 1970s. Each burst was followed by an AI winter (Floridi 2020). What is probably new is the AI-based prediction and classification of everyday life. So, there are already voices that call for algorithmic silence and to decomputerize (Penn 2021). These voices demand special attention, especially since they are accompanied by influential statements as: "[w]e thought knowledge was about finding the order hidden in the chaos. We thought it was about simplifying the world. It looks like we were wrong. Knowing the world may require giving up on understanding it" (Weinberger 2017); it is a statement that is at odds with our scientific practice (Mazzocchi 2015).

We hope that true digitalization facilitates mutual interaction between the agents of knowledge. Many would probably agree that digital co-creation is promising (Giaccardi 2012; Simon 2011). Digital can potentially empower people to explore and understand their past. Moreover, cheaper computation promises to reach broader audiences. In the meantime, *free* applications and online platforms (*e.g.*, Google Earth) facilitate and organize work. The promise accompanies a growing optimism in technological advancements and faith in absolute digital futures/twins. However, we are also aware that our digital relationships and relationships with the digital are ever-complex and growing in time. And as the digital world grows, we collectively produce and witness broken promises.

There is tremendous value in and through digital, and as "digital archaeologists" we welcome the progressive digitalization of our archaeological discipline. However, as the authors, we also observe that a digital promise may not always satisfy to the expectations of the digital practitioner. We explore this condition through a critical reading of digital metaphors and myths. We suggest that through these two concepts, we can *also* understand how and why (false) promises and (avoidable) impasses are brought about. Specifically, in the following we also try to understand how digital influences/transforms our understanding of archaeological collaboration and labour. We suggest studying metaphors, myths, and transformations might offer some hints for tackling *failed promises*. We aim to situate ourselves in a sandbox (Politopoulos and Mol, this volume) where we build and unbuild things. Yet, our aim is not to offer an alternative framework to digital archaeology but highlight some of the influential agencies related to the production of archaeological knowledge.

## 2 (Digital) metaphors and myths

Forming, using, and forgetting metaphors and myths are fundamental human traits. Metaphors help us understand one concept through understanding another (Lakoff and Johnson 2008; Massey and Ehrensberger-Dow 2017). And, simply put, a myth is a network of ideas without necessarily imposing truth or falseness (Christensen and Cornelissen 2015). As they explain much about us, metaphors and myths are subject to countless inquiries through scholarly work.

The metaphor has more visibility in linguistics, but as archaeologists, we can still focus on the metaphorical instead of the semiotic nature of material culture (Coward and Gamble 2010, 48). Metaphors also shape epistemologies. One of the richest examples of a metaphor is the map (Smith 2007). At the end of the day, "[s]pace is fundamental in any exercise of power" (Foucault 1984, 252), and maps facilitate authorship. Metaphors also help archaeologists transfer ideas from other disciplines, as in "the use of the evolutionary metaphor" (Bamforth 2002, 435). Archaeology can be a metaphor itself: "[i]n face of the incompleteness of my analytic results, I had no choice but to follow the example of those discoverers whose good fortune it is to bring to the light of day after their long burial the priceless though mutilated relics of antiquity… like a conscientious archaeologist, I have not omitted to mention in each case where the authentic parts end and my constructions begin." Freud (1953, 12). Metaphor shapes the digital world. The user commands the flow of electronic signals on the *desktop*. Our desktop has *files, notepads*, *folders*, *recycle bins, etc.* Metaphors are also part of internet terminology; *web*, *portal*, *and gateway* are only a few.

We now move on to the myths. In and through archaeology, we may make myths more visible or challenge them by, for instance, exploring Indo-European origins (Mallory 1992), revealing

2 For a critique of the term, see Edgerton (2011). For instance, he asks why we consider 21st-century electric cars innovative if around 20% of motor taxis were already electric between 1907 and 1918 (2007: 9).

uniformized pasts (Olsen 1986), scrutinizing existing narratives (Hall 1984), or disentangling the state's role in these narratives (Fowler 1987). The list is long, so we fast-forward again and point at the resurgence of older myths in the new scientific era. Ancient DNA analysis, a promising tool, is now also a myth-maker (Hakenbeck 2019; Wolinsky 2019) and it now influences the narratives of politicians (Hamilakis 2017; Netanyahu 2019) and the public (Broodman 2017).

Not surprisingly, myths are also part of the digital world. We claim through myths and myth-making the digital finds place in our lives. Realizing how digital myths are shaping the world many colleagues have been studying many aspects of the phenomenon in different scholarly, socio-economic and geographic contexts and helping us to build informed digital futures (*e.g.,* Alzouma 2005; de Saint Lauren 2018; Jennings and Zeitner 2003; Kirschner and De Bruyckere; Webster 2017; Ziewitz 2016).

The digital usually arrives with a narrative suggestive of particular understandings and readings of the world. So, we hope to challenge some fundamental assumptions we make about the digital archaeology as well. To start our inquiry, we first explore two examples (the cloud metaphor and the myth of digital inclusivity) in their general and archaeological contexts. We consider archaeology broadly, including research, education, field practice, museum studies, heritage and the like. We selected these examples opportunistically and based on our interests. It should be possible to identify and explore other examples.

### *2.1 The Cloud Metaphor*

Cloud computation involves distributing digital tasks over (a network of) large data centres equipped with high-processing computers. Mainly determined by the infrastructure needs, a cloud can be as large as a warehouse. Users connect to the cloud and perform online tasks, ranging from scientific computation to email communication. Depending on the amount and frequency of demand by users, computation resources can be scaled up and down, "creating the illusion of infinite resources available at any time" (González-Martínez *et al.* 2015, 132). Motivated at least by the idea of infinite computation, clouds promise access to digital platforms, software, and data storage space at lower costs. After all, the invisible hand of competition benefits all (see Zernik 2019).

Khmelevsky and Voytenko (2010, 1) identify three major trends in cloud computing:

- Virtualization (the separation of apps/software from hardware)
- Utility computing (metered use of hardware)
- Software provisioning (on-demand use of software)

Aligned with these trends, we are gradually moving away from high-performing personal computers and local servers for our scientific needs; it is now possible to command a virtual machine and perform complex tasks in the cloud using a rudimentary computational device with a reliable internet connection. In particular, technologists, scientists and policymakers are expecting 5G will bring massive changes to cloud computing as experts claim ultra-fast data transmission will -once again- revolutionize[3] network and communication technologies.

Cloud experts almost always communicate with the rest through graphical representations of the metaphor. To the common eye, data icons, app symbols, digital services and other Internet of Things (IoT) objects surround the cloud (figure 1). These representations imply cloud computing is flexible and always open to changes. Therefore, the metaphor carries the image of scalability but sustains a sense of distance; it is beyond one's reach. The digital metaphor starts obscuring the material even at this very representation stage. We are interested in this metaphorization for two main archaeological reasons. First, we want to understand the digital entity (*e.g.*, a row in a spreadsheet, an e-mail, a 3D scan of an object, a pre-trained deep learning model, etc.) as a sociotechnical object and explore the producers of its possibility, such as "infrastructures, assemblages, and political economies" (Philip *et al.* 2012, 10). Second, we want to highlight the materiality of clouds and opportunistically plot archaeologists' interaction with the cloud so that the cloud is closer to reach.

It is simply because cloud computation relies on physical infrastructure. Consequently, the cloud *is* an infrastructure. It is made of advanced computing

3 https://www.ibm.com/industries/telecom-media-entertainment/resources/5g-revolution/
The frequency of these revolutions is astonishing -to our reading their pace exceeds and dilutes the meaning of the word. In scientific framework, for instance, the discovery of penicillin was revolutionary as it shifted the perception of death in human societies. It is not clear how and why the 5G revolution is different from the 4G revolution.

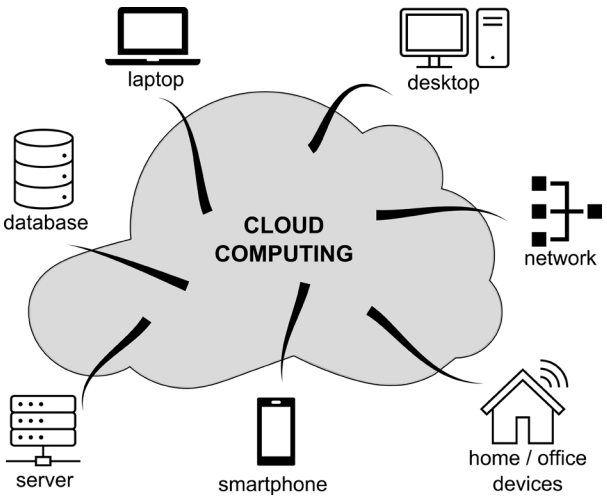


Figure 1: A common graphical depiction of cloud computing. The concepts/icons surrounding the cloud may change in number or arrangement, but the computing is clouded.

machines stacked side by side and on top of each other, sometimes kilometres-long fibre-optic cables, a reliable electricity grid, cooling machinery, and a strong building (even former World War bunkers and military-grade underground facilities[4]) to house everything. The cloud is the name of a physical meshwork, junctions being the data centres. Through the material visibility of a warehouse, "cloudfrastructures alert us to multiple layers of carefully produced and guarded invisibilities" (Furlong 2021, 191). And, in the invisibilities, we attempt to highlight power structures/agencies embedded in infrastructures and their building processes (Rodgers and O'Neill 2012), but mainly in the context of archaeology and heritage studies.

To begin with, working in the cloud gives a sense of decentralization. However, cloud computing does not exhibit signs of deterritorialization on actual geography. Rather, it presents a model of reterritorialization (Amoore 2018, 8). Large data centres mainly owned by the big-tech companies cluster in geographies that provide access to energy, tax incentives, water sources, and suitable digital infrastructure. The infrastructure sits in certain locations since stable data flow also requires stable political geographies. The recent plea for energy efficiency and carbon footprint reductions also influenced tech companies to locate their warehouses in countries with a tradition of building green energy infrastructures, such as Denmark (Maguire and Ross Winthereik 2021) while making use of colder climates. These high-performing cloud machines require periodic upgrades to keep up with the number and amplitude of digital requests, at the cost of giving a sense of infinite resources. So, electronic waste is building up (Lepawsky 2015). It is no surprise then that the centralization of computing is a geo-political process (Roguski 2020).

### *2.2 Cloud Computing in Higher Education and Archaeological Research*

The cloud paradigm/metaphor is consequential all across the board, including education and research. For instance, open-source software has a conflicted relationship with the cloud (CYOP *n.d.*; Ramel 2021; Tunguz 2021). It is not certain how cloud computing will merge with the open-source / open-access paradigm. Archaeology, being a "financially-poor" discipline, widely benefited from the open source. On a broader scale, archaeologists have been making significant progress in open science, notably in digital data. While significant experience is being accumulated, it is still unknown how platformization and cloud computing will affect the future of collaborative archaeological knowledge production.

To begin with, archaeologists use the cloud in various ways, such as performance computing (*e.g.*, Rubio-Campillo 2015) or fieldwork (*e.g.*, Matsui *et al.* 2012). Heritage studies in general, but museums in particular, are leading the path in cloud-based solutions (*e.g.*, Vecchio *et al.* 2015; Yang *et al.* 2020 ). Constructing digital 3D objects and performing photogrammetric solutions in the cloud are notable examples of the new computing paradigm (*e.g.*, Kersten and Lindstaedt 2012). Public engagement can also happen in the cloud (*e.g.*, Lambers *et al.* 2019). Citizen science projects, such as Zooniverse, are built over a cloud platform, in this instance, Microsoft's Azurecloud computing service.

Museums are of particular interest. Digitalization of material culture and generation of massive amounts of data now requires high-tech solutions; big data requirements are pushing the operational capabilities of institutions (Pesce *et al.* 2019, 1884). To satisfy digital needs, museums should either improve their infrastructures through machinery purchases and technical staff hires, or collaborate with new partners. With their scalable cloudfrastructures, big tech offers

4 https://datacentremagazine.com/data-centres/top-10-underground-data-centres.

services and solutions -museums as the content creators. In collaboration with Google, some prominent museums (*e.g.*, Musée d'Orsay in Paris, British Museum in London, Rijksmuseum in Amsterdam, and Acropolis Museum in Athens) have set up online interactive museum visits and object interaction displays thanks to cloud technologies.

Universities and research institutes also use cloud solutions by the big-tech (Khmelevsky and Voytenko 2010; Al-Busaidi 2012). Higher education profits from cloud computing at different levels. For instance, now it is common in higher education to rely on Microsoft's Office 365 or Google Enterprise Apps for Education as they provide convenient and familiar ways of communication as many of us use these products in our everyday life (when exactly have we *all* become digital archaeologists?). Google Earth, for instance, greatly changed the way we teach, learn, and present archaeology. A wide variety of free or pay-as-you-go e-learning services (such as Coursera, Udemy, etc.) offer Massive Open Online Courses (MOOCs) challenging, shaping, or influencing how archaeology tutors interact with students -especially as educators have to handle an increasing number of students. Archaeology takes part in these platforms[5] and as such students greatly benefit from cloud applications.

Emerging collaborations between the corporate world and education should not come as a surprise since cloud computation offers multi-sided marketing strategies. A while back ago, Google in cooperation with IBM, established strong ties with universities to fulfil our daily digital needs (Lohr 2007); a market has been created. And overall, archaeology increasingly relies on cloud solutions and computation. But, should we not also explore what cloud is covering/veiling/hindering as we develop more ethical, non-exclusionary and scientific digital approaches to archaeology?

We try to provide a brief answer to our rhetorical question above. Our two examples below are by no means exhaustive. But our hope is that our subjective look at the cloud metaphor can provide seeds for future critical studies. For instance, as we mentioned above many citizen science projects, including archaeology projects, run on Microsoft Azure cloud computing system. It is the same platform that provides service to the US military (Lockheed Martin 2022; Microsoft *n.d.*). So, we speculate the terms civilian and military amalgamate in the cloud, especially in the age of big data (see Dunne and Sköns 2011). In this particular case, it is not clear to us if the know-how acquired in the civilian sector is not used in the military cloud, and vice versa. To date, we were not able to identify an online Microsoft user agreement that could provide an answer. If we shift our attention to heritage computing we see an equally problematic area. To us it is clear that the necessity to outsource the (digital) curation in the cloud adds further complexity to heritage stakeholder relations. The visitor of the museum is also the user of the platform. And while large and famous museums add more to their fame, smaller and local museums already struggling with budget shortages must also go digital to retain their visibility. The artefact in the museum is now a sociotechnical object that is not static but part of the capitalization process that is always in motion. So, the cloud is a perfect metaphor to guise profit-driven value creation, also in archaeology. It is also in the cloud that labour is transformed, as we are facing a renewed value system (see the section on Transformations).

### *2.3 The Myth of Inclusivity*

We begin with a standard definition of inclusivity. While the term has variable meanings -as there can be no fully inclusive definition- a dictionary definition holds for the reasons it is being used here. According to the Oxford English Dictionary, inclusivity is "[t]he fact or quality of being inclusive; (now) esp. the practice or policy of not excluding any person on the grounds of race, gender, religion, age, disability, etc." As many can agree, inclusivity is introducing a new norm in research, practice, and teaching in archaeology.

And thanks to digital technologies, more inclusive archaeology is possible more than ever. Co-creation, participation, and democratization are now viable options in archaeological knowledge production. For instance, citizen science is an emerging tool, promising to merge the gap between citizens and our ivory towers. It is also now apparent that citizen science can be beneficial to many, spanning ranges from children (Makuch and Aczel 2020) to the elderly (Barrie *et al.* 2019). But who participates in citizen-science projects? We rephrase to emphasize and set our agenda: who are these citizens we, the archaeologists, are collaborating with? Through these projects do we risk empowering a group of citizens over others?

5 Some notable examples: https://www.coursera.org/learn/palatine-hill-archaeology-history, by Sapienza – Università di Roma in Italy; https://www.coursera.org/learn/truthinourbones-osteoarchaeology-archaeology, by Universiteit Leiden in the Netherlands; https://www.coursera.org/learn/wonders-ancient-egypt, by University of Pennsylvania.

At this moment we pause and claim that the way digitalization works contributes, and considerably, to the social divide in many forms and ways. In the current setup, people with more/better access to digital skills will gain further privileges in society (Ragnedda 2020, 40-3). The digital divide is dynamic in the sense that differential access, use, and capitalization of internet and communication technologies (ICT) is generating new forms of poverty while bolstering existing inequalities (Wessels 2013, 18). Digitalization of services benefits many, but not all; people with better access to ICT have higher participation in the current governance models or are naturally better aware of digital public engagement projects. People with limited access to ICT are further excluded from decision-making (Sanders and Scanlon 2021, 131).

Digitalization excludes three levels (Ragnedda 2020; van Dijk 2013). At the first level, the individual/group does not have the means for connecting to the digital world. Broadband internet is one of the key requirements for digitalization. Globally, 40% of the world's population is excluded from the online world in one way or the other. Material conditions of digitalization are still a concern even in fully connected and developed regions of the world (van Deursen and van Dijk 2019).

At the second level, the digital divide lies in the lack of information and skills for using ICT. The second level divide is intrinsically related to other existing forms of inequalities (Ragnedda 2020, 46). It is true that the digital divide between men and women is almost closed in some countries, but remains high in developing countries and "the reason why fewer women access and use ICT is a direct result of their unfavourable conditions concerning employment, education and income" (Hilbert 2011, 479). ICT pertains to other forms of inequalities in the developed world as well. Women use ICT in lesser frequency (Wasserman and Richmond-Abbott 2005), lower intensity (Hargittai 2010) and with less peripheral diversity (van Deursen and van Dijk 2019).

At the third level, Scheerder *et al.* (2017) and Wei *et al.* (2011) identify the digital divide as the lack of capacity of a person/group to transform or transfer between digital and other capital types. "The position held in the social hierarchy not only influences how individuals access and use ICTs but – being the field in which the seeds of digital experience are sown – also determines the concrete benefits individuals receive from the use of ICTs." (Ragnedda 2020, 49). That is, underprivileged individuals and groups are further punished for not being fully integrated into the digital realm as they lack the means for the transformation/transfer of digital capital into other tangible and intangible capital. As people build and promote citizen-science projects, to what extent do they pause and explore -beforehand- at least some of the concerns above? Are archaeologists interested in citizen science or citizen data (Purdam 2014)?

### *2.4 Digital Inclusivity in Archaeology*

There is notable scholarly work contributing to digital inclusivity, especially in the heritage domain (*e.g.*, Simon 2011; van der Hoeven 2020). Familiar to almost all of us, Geographic Information Systems (GIS) is one of the major digital realms where inclusive approaches are critically discussed. Participatory GIS projects, for instance, offer more inclusive research (see Dunn (2007) for a general review and see Larrain and McCall (2019) for a representative archaeological and historical application). Despite successful attempts, Elwood, for instance, warns us participatory approaches also "introduce new tensions and paradoxes into GIS" (2006, 697).

Digital inclusivity in emerging crowdsourcing approaches is a concern in information sciences (*e.g.*, Estellés-Arolas and González-Ladrón-de-Guevara 2012). Crowdsourcing has notable use cases in geographic (See *et al.* 2016) or qualitative analysis (Mathews *et al.* 2018). Archaeologists also conducted notable projects using citizen-science approaches (*e.g.*, Jennings *et al.* 2017; Lambers *et al.* 2019). Crowdsourcing may involve active data generation by participants. However, it is also possible that citizens produce information about heritage in their social media activities, eventually generating a massive online resource. Using this 'passive' pool of information researchers can conduct media analysis on a micro/local scale (*e.g.*, Wight 2020) or can 'mine' macro/large-scale data (*e.g.*, Rashid and Qasha 2022; Riva *et al.* 2019). Finally, community-involved participatory and inclusive projects, methods, and theories are now more visible, such as archaeogaming (Politopoulos and Mol, this volume).

Despite some key challenges, such as lack of expertise, resources and priorities, geographical dispersion, and community (dis)connection (Harkema and Salt 2017), digital co-creation is still promising an inclusive production of archaeological and heritage knowledge through active participation of the public. In notable examples where there is direct participation, researchers made use of digital worlds to better

understand how people value historic urban landscapes (van der Hoeven 2020), enhanced museum curations and created more inclusive and dynamic histories (Cook and Hill 2019) or developed artefact databases for a better engagement of the local community with fieldwork practices (Moser *et al.* 2020). Another example comes from Çatalhöyük. Morgan (2009) addresses virtual worlds and discusses their potential for better communication with non-expert audiences. Morgan and Eve further challenge us for more "ubiquitous, reflexive, open and participatory archaeology on both the institutional and the individual level" (2012). But if we are 'all' digital archaeologists what is the state-of-the-art in true emancipatory archaeology?

In other non-direct/non-voluntary, but still collaborative approaches, scholars can make use of existing data procured by the public. For instance, Grün *et al.* (2004) successfully performed a photogrammetric reconstruction of the now-destroyed Buddhas of Bamiyan, Afghanistan using already available images on the internet. Similar passive approaches are becoming more visible in the analysis of social media relevant to our discipline (*e.g.*, Rashid and Qasha 2022). It must be remembered that scraping social media data for heritage analysis has bottlenecks. Twitter, for instance, provides a biased sample unless the user opts-in for a costly Firehose API (Morstatter *et al.* 2013).

In contested landscapes, the hope lies in the adoption of scholarly work by local communities so that one can "move beyond data-sharing" (Hammer *et al.* 2018, 142). The same reality casts a dark shadow on efforts in preserving the Afghan cultural heritage through participatory activities (*e.g.*, Constantinidis 2016), and digital tools of archaeology fail to support peace and identity-building efforts (Dupree 2002). Archaeologists can play major roles in assisting politically torn countries to manage their heritage. However, digital work in contested landscapes often has to face the analogue reality, as in the case of the heritage of Afghanistan. The promise of the digital dissolves rather rapidly with realpolitik. The promise has geography and is not valid globally.

We shift our focus to Wikipedia as it is known to be a reliable fully open resource, for instance, in higher education (Chen 2010). Rosenzweig (2006) asks if history can be open-source and scrutinizes Wikipedia as an open-access tool. In particular, Marwick and Smith (2021) systematically investigate the representation of UNESCO World Heritage cultural sites on this platform. They identify places in the Global North that are over-represented. In contrast, heritage sites in South American countries are underrepresented, and inclusivity is the worst for African countries. Furthermore, Wiki articles receive edits mainly from the core Anglosphere countries (UK, USA, Australia, and Canada), suggesting the continuation of (digital) domination over knowledge production. A generic predictor for a Wikipedia editor is a young male with good Internet skills and a high frequency of use (Hargittai and Shaw 2015). So, we ask how inclusive Wikipedia's information generation is. For us, the digital provides ample opportunities for doing inclusive education, knowledge generation, and its dissemination. On the other hand, we also acknowledge that true inclusivity is possible only when the issues are tackled in everyday analogue life. Otherwise, it is certain that the digital will fail another promise, and inclusivity will remain a myth.

## 3 Transformations of collaboration and labour

So far, our focus has been on metaphors and myths. We explored cloud computation to highlight how metaphors can veil critical parts of digital transformation in our discipline. And we discussed how digital inclusivity could quickly become a myth as digitalisation continually broadcasts an image of successful change; providing a critical reading of digital transformation in archaeology has been our primary concern[6]. Now we attempt to flesh it out further by focusing on a single example: collaboration, and how collaboration is changing due to digital praxis. The metaphor is appropriate here since it is in the cloud, that archaeologists often collaborate with each other. And with digitalisation, many argue that "[s]ocial media, mobile apps, and teleconferencing platforms allowed for inclusive collaboration" (Dewhurst *et al.* 2014, 467). To understand the true nature of digital collaboration, we can turn our critical attention to the ways in which archaeologists (and humanities scholars in general) collaborate. We argue that archaeological scholarship needs further reflections to challenge the misplaced optimism on collaboration; and how it is -in fact- deeply rooted in digital labour processes.

Collaborative efforts are taking an increasingly large and more explicit position within archaeology

6 It is also possible to reverse our workflow and ask about the role of "archaeology and archaeological information in the digital society" (Huvila 2018).

(and related domains, such as digital humanities and digital heritage) as the field continues to digitize (*e.g.*, Bonacchi and Petersson 2017; Brown 2016; Griffin and Hayler 2018; Kemman 2019; Wright and Richards 2018). However, both in archaeology and related domains critical reflection on the relationship between (academic) collaboration and human labour processes is rare. Among the few cases are the conclusions drawn by Nowviskie (2011, 171). She points out that the role of digital humanities practitioners outside of the ranks of tenured and tenure-track faculty is systematically overlooked in digital humanities research. Related, Mann (2019, 269) observes powerfully that "collaboration, as it is typically practiced [within digital humanities], risks shutting graduate students out of the very scholarship they laboured to produce". According to Mann (2019, 269) this paradoxical situation comes about since graduate students are often treated as employees in digital collaborative projects with their labour power being commodified. In archaeology, Perry and Beale (2015) focus on the use of digital social media and how such media can be too easily considered collaborative and, as such, unquestionably progressive. They highlight that unjustifiably affirmative discourse used to re-present digital participation (*e.g.*, crowdsourcing, blogging) in archaeology and heritage results often in free labour (in the form of voluntary work) and the risk of exploitation.

For more than a decade, a strong link has been in the making between the concept of collaboration and that of infrastructure. Specifically, the term "infrastructure" started to hype in the 2000s onwards within the European Research Area (Hallonsten 2020), when various "assemblages" started to be referred to as infrastructures. In that context affordance of collaborative research started to be presented as a positive asset for these infrastructures. Arguably, this successful marriage helped both concepts, namely collaboration and infrastructure, to dodge critical reflection: collaborative digital research infrastructures have been presented as an alluring technological innovation, a new way of doing things, and a type of progress. They were praised to promote communication, multivocality, openness, dialogue, and sharing as well as a diffused model of authority and authorship; and, of course, inclusiveness. They have been argued to bring about reliable and visible research results while enabling the aggregation of big and distributed data sets (Edmond 2015, 62-3; McCarty 2012). These data sets are usually hosted in the cloud, providing further means for being visible while implying an invisible (physical) infrastructure. The European Collaborative Cloud for Cultural Heritage with an intended budget of 110 million euros until 2025 from Horizon Europe is the next major initiative of the European Union in this direction. The cloud would "foster cooperation and co-creation among cultural, creative and technology sectors and will help safeguard European cultural treasures through a digital infrastructure" (ERRIN 2023).

One question that so far escaped empirical attention is whether these statements about collaboration (and cooperation and co-creation) and digital research infrastructures are always accurate – or accurate at all. If they are only conditionally accurate, we need to ask ourselves under which conditions collaborative digital research infrastructures are as progressive as they are described to be. Put differently, how and, perhaps more aptly, when and for whom collaborative digital research infrastructures are different, new and "better" in comparison to their counterparts with an accentuated corporate and commercial logic such as Elsevier and JSTOR (James 2020)?

To unpack these questions, on top of physical infrastructures one also needs to come to terms with the "human dimension" of digital research infrastructures and their highly relational nature. In our opinion, understanding them as "technologies" in the Marxist sense of the word provides a framework. Geographer David Harvey (2018, 9) provides the following definition of the term technology: "For Marx, the question of technology looms large as it does in almost all forms of economic analysis. Marx's definition is broad and all-encompassing. Technology does not only refer to the machines and tools and energy systems put in motion (the hardware as it were). It also includes organisational forms (divisions of labour, structures of cooperation, corporate forms, etc.) and the software of control systems, time and motion studies, just-in-time production systems, artificial intelligence and the like." Cloud technology, for instance, is a prime example. The cloud is not only an ever-expandable and powerful but out-of-reach metaphoric space, but it is also made of massive machines, cooling systems and relevant infrastructure, wires, etc. At the same time, the cloud is not merely machines but it comprises an assemblage of socio-technical objects that are the material manifestations of particular intentions and thus, have human and material consequences, ranging from environmental (Monserrate 2022) to privacy and security (Xiao and Xiao 2013).

Some definitions of digital infrastructures match well with the Marxist definition of technology presented here (*e.g.*, Anderson 2013; Crane *et al.* 2009; Brown and Greengrass 2010, 1; Benardou *et al.* 2018, 3). This convergence happens precisely when "social factors" – that is, different forms of human organisation and cooperation – get acknowledged as crucial constitutive elements of digital infrastructures. In other words, approaching digital research infrastructures requires treatment of software, hardware and "the social" (*e.g.*, scholarly practices, user needs, institutional traditions, human labour) as on equal footing, if not inseparable.

A quick etymological investigation is quite revealing. The Concise Oxford Dictionary of English Etymology ties the word with Latin "collabōrāre. f. COL- + labor LABOUR." Col- is assimilated from com- meaning *together*. In other words, as people collaborate, they labour together. So, we naturally ask: could any digital infrastructure still qualify as being collaborative when we consider not a select group, but all agents involved? We draw particular attention to the labour of graduate students and post-doctoral scholars discussed above, who often find themselves in precarious labour appropriation that co-exists with the ideas of and hopes of collaborative knowledge production. Another concern that requires attention here regards the hardware and "the social". That is, what about the human labour involved in producing material components that comprise collaborative digital research infrastructures? It is a known (but surprisingly under-discussed) fact that materials involved in building and using these infrastructures (such as those that make up computers, mobile phones, tablets, network cables, servers, docking stations, and laptop bags) are almost always produced out-of-sight. How genuinely collaborative can the so-called "collaborative research infrastructures" be when the very hardware that they are built with threatens the well-being of humans that were involved in their production process (*e.g.*, Fuchs 2013, 155-180)?

## 4 Conclusion

We realize our readers will see us painting a rather dark picture of the current state of digital archaeology. Practising archaeology for the sake of practising archaeology is a privileged position. And, as the authors, we acknowledge our privilege of being based in two Benelux countries in tenure(-track) positions. Our everyday life experiences show us that the optimism of digitalization does not chip away from imbalanced power dynamics within our discipline. A genuinely inclusive practice, research, teaching, communication, dissemination, and outreach are bounded by impasses that are usually -but not always- out of our control. For that, we will keep practising (digital) archaeology and carry optimism for the future. Yet our concern has always been the uncritical adoption and use of digital theories, tools and methodologies. As information and communication technologies advance, archaeologists arguably tend to constantly push the envelope using cutting-edge tools and technologies to move beyond state-of-the-art collectively. In this chapter, we paused and generated a series of questions: where do archaeologists push the envelope? Have archaeologists depleted their existing computational resources in the current affairs of the state-of-the-art so that they have to be constantly on the move, or are they mainly influenced by the socio-technical climate of the data-driven era? Who are the primary drivers of this era, and who benefits the most from the new state-of-the-art? Can archaeologists reimagine and reconfigure how they do things so that our digital advancement does not harm the material life of others? To put it speculatively and bluntly, is digital archaeology creating a new form of colonialist practice, albeit remotely?

In this chapter, we also argued -despite the broadcasted image-, current digital technologies only *appear to* be decentralizing and deterritorializing. In the new connected territories, the winner takes it all (Pesce *et al.* 2019, 1885). Metaphors are hiding the material bases of the digital, further contributing to the invisibility of the disenfranchised. The privileged are also alienating from their labour; as people labour to make use of a "free" product they contribute to its value with their working hours (Fuchs 2014, 131). In other words, labour relations have become more invisible in the metaphoric cloud as people contribute to the myth of a free product.

It appears that the digital divide will remain unless divides in the world are tackled. In some cases, emerging digital tools and approaches consolidate existing biases even though they claim to bring machine *objectivity* as a remedy for human *subjectivity* (Hacıgüzeller, Taylor and Perry 2021). Especially, it is not clear if new promises made through big data, machine learning, and other automation practices can indeed help archaeologists to practice more inclusive and collaborative archaeology at the same time. Yet, our optimism lies in the possibility of other digitalities to invent. We will dig more into this sandbox. And as we play, we hope to:

- Emphasize power relations that are naturally embedded in the digital. This begs the creation of a social theory of digital (van Dijk 2013; Ossewaarde 2019; Roth 2019).
- Highlight digital inequalities. Current literature suggests, digital and other forms of inequalities go hand in hand. The social theory of digital archaeology can directly address these inequalities in all necessary forms, including data activism (Thompson 2020).
- Recognize the digital divide as a human rights and social justice issue (Sanders and Scanlon 2021).

We wrap up with the latest digital promise. As we (re-) enter the era of artificial intelligence and dream of digital twins/minds, the idea of a holodeck rises again. Our old Universal Turing Machine is now truly a "universal fantasy machine" (Murray 1997, 17). So, we ask a final question: whose fantasy is this that we are living in?

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