Archaeological data work as continuous and collaborative practice

by

Zachary Batist

A thesis submitted in conformity with the requirements
for the degree of Doctor of Philosophy

Faculty of Information
University of Toronto

Archaeological data work as continuous and collaborative practice

Zachary Batist
Doctor of Philosophy

Faculty of Information
University of Toronto
2023

Abstract

This dissertation critically examines the sociotechnical structures that archaeologists rely on to coordinate their research and manage their data. I frame data as discursive media that communicate archaeological encounters, which enable archaeologists to form productive collaboration relationships. All archaeological activities involve data work, as archaeologists simultaneously account for the decisions and circumstances that framed the information they rely on to perform their own practices, while anticipating how their information outputs will be used by others in the future. All archaeological activities are therefore loci of practical epistemic convergence, where meanings are negotiated in relation to communally-held objectives.

Through observations of and interviews with archaeologists at work, and analysis of the documents they produce, I articulate how data sharing relates distributed work experiences as part of a continuum of practice. I highlight the assumptions and value regimes that underlie the social and technical structures that support productive archaeological work, and draw attention to the inseparable relationship between the management of labour and data. I also relate this discursive view of data sharing to the open data movement, and suggest that it is necessary to develop new collaborative commitments pertaining to data publication and reuse that are more in line with disciplinary norms, expectations, and value regimes.

Witness Mr. Henry Bemis, a charter member in the fraternity of dreamers. A bookish little man whose passion is the printed page, but who is conspired against by a bank president and a wife and a world full of tongue-cluckers and the unrelenting hands of a clock. But in just a moment, Mr. Bemis will enter a world without bank presidents or wives or clocks or anything else. He'll have a world all to himself... without anyone.

Time Enough at Last, The Twilight Zone, 1959

For my parents

Acknowledgements

I dedicate this dissertation to my parents, whose love, generosity, and support made this work possible.

It is impossible to understate my gratitude to my doctoral supervisor, Costis Dallas, for his thoughtful mentorship and support throughout this journey.

I am also extremely grateful to Matt Ratto and Ted Banning, whose constant critical feedback helped me find my own voice. I could not have asked for a better supervisory committee.

I owe special thanks to Jeremy Huggett and Ed Swenson for taking the time to engage with my work as external examiners, and for your enthusiastic support.

The seven years I spent at the Faculty of Information were made much more enjoyable thanks to my brilliant PhD cohort – Camille, Curtis, Dawn and Lindsay. Our enduring friendship, support, and mutual commiseration truly helped me get to where I am today.

Thank you to the numerous other friends and colleagues from the Faculty of Information who kept me motivated over the years, especially Natalia, Emily, Jack, Cansu, Alex, Amy K., Asen, Priyanka, Jess, Rebecca, Gabby and Chris.

And to my friends, colleagues, and mentors in archaeology and beyond, especially Paula, Amy F., Giles, Stephen, Branden, Fan, Hilary, Paulina, Joe, Sophie, Ezra, Anka, Adam, Jason, Shawn, Ben, Michael, Dan and Tristan.

Special thanks to Brian Cantwell Smith, Lynne C. Howarth, Jenna Hartel and Christoph Becker for their mentorship at various points during the doctoral program, and to Christine Chan and Ruth Maddeaux for their administrative support.

And to my friends and family outside academia for always being there when I needed them most – Alex, Joey, Natalie, Adam, Jordan, Jonah, Kira, Andrew, Cayleb, Charlie, Cooper, Ellie and Bob.

Of course, this project would not have been possible without the numerous anonymous research participants, who allowed me to observe and interview them as they worked, and to articulate their actions and outlooks throughout this dissertation.

Contents

List of Tables

List of Figures

List of Excerpts

Glossary

Activity A purposeful interaction of a subject with the world, directed towards some object, and mediated by physical, technical and cognitive mediational artefacts.

Collaborative commitment Norms and expectations that govern relations among agents participating in an activity.

Continuum of practice The extended chain of action, whereby agents account for the influences of prior decisions while simultaneously anticipating how their own decisions will affect future uses of the outcomes of their own actions.

Discursive That which supports active exchange of ideas to arrive at mutual understanding.

Distributed action A way of thinking about action as emerging from series of interconnected and interdependent components. Study of distributed action involves examining interfaces between active components and investigating how the system is driven to achieve overarching objectives.

Formal The quality of adhering to rules of convention or protocol, suitable for or constituting an official or important situation or occasion. Formality renders individual actions in subservience to broader systems of control, ensuring that behaviour, and the outcomes deriving thereof, conform to institutional or technical expectations and standards.

Infrastructure The systems that mediate between local and global. May comprise social, technical, and conceptual elements to foster mutual understanding.

Media Means through which information is communicated or expressed.

Situated action A way of thinking about action that emphasizes the ways in which actors see and live in the world differently based on their past experiences and

understanding of social contexts. Study of situated perspectives involves examining the improvised, contingent, and embodied experiences of human action, with emphasis on highlighting subjects' outlooks, contextualized by their prior experiences.

Social world A discursive domain of action, comprising series of tools, methods, attitudes, and values. Members of various social worlds commit to achieve objectives of mutual interest by entering into cooperative or competitive arrangements with actors from other domains.

Chapter 1

Introduction

Archaeological research is inherently collaborative. It involves teams of people bringing together a variety of unique outlooks and experiences to examine material assemblages of common interest. Archaeologists apply a multitude of tools and methods, in sequence and in tandem and across different kinds of work settings, to produce rich and heterogeneous data about their engagements with the archaeological record. They adhere to professional norms and expectations to organize the products of their collective labour, and rely on a combination of digital and analog devices and protocols to pool the outcomes of their respective tasks.

Moreover, archaeologists derive their ability to ascribe and transmit meaning to things from their experiences learning from others and conforming to generally understood mental models. Archaeological knowledge is thus created and effectively communicated through participation in research collectives, which contribute to the formation of a general and inarticulable sense of professional solidarity, or commonly-held values and affinities, which bind together the myriad ways in which archaeologists do archaeology. The social bonds that connect archaeologists to a common professional identity are therefore crucial for facilitating in-depth scholarly communication, either among close colleagues or between remote strangers via the web.

Archaeological knowledge is thus collaborative, collective, and social. It is important to remember this in light of recent efforts to develop open archaeological information infrastructures, particularly systems for facilitating the transmission of research data on a global scale, and which operationalize data sharing as a technical, asocial activity. The aim of this thesis is therefore to articulate and reorient archaeo-

logical data management as social, collaborative, communicative, and commensal in nature.

1.1 The open science imaginary

In a 2012 special issue of *World Archaeology*, which served as a seminal venue advocating for open archaeology, Beck and Neylon (2012) characterized their vision for open archaeology as

> predicated on promoting open redistribution and access to the data, processes and syntheses generated within the archaeological domain. This is aimed at both the production and consumption of archaeological knowledge with the associated aim of maximizing transparency, reuse and engagement while maintaining professional probity.

This corresponds with the aims of the broader open science movement, which is concerned with making various kinds of research operations, including data sharing, publishing, education, review processes, grantsmanship, and software development, more "open", referring to a state whereupon "data and content can be freely used, modified, and shared by anyone for any purpose" (Open Knowledge Foundation 2015). Although the notion of openness is somewhat ambiguous, open science advocates believe that granting free access to all data and findings that have ever been produced will empower researchers to develop enhanced knowledge in the future. While it is hard to disagree, in principle, with efforts to grow our collective knowledge base, to make science more inclusive, to restore publicly-funded research outcomes to the public trust, and to explore new research horizons, the premise that making data available on the web will accomplish these noble objectives is unsubstantiated, largely because it is informed by a flawed vision of what science actually is and entails.

The open-science imaginary considers the accumulation and assembly of data as contributing to a species-level understanding of the world, which is stored in value-neutral and purely representational media such as books, scientific reports, and internet-connected archives (cf. Bush 1945). This aligns with a naive view that the scholars and librarians who produce and maintain these information stores exhibit the virtuous traits of scientific objectivity, openness to alternative perspectives, and the capability to critique ideas in a rational and structured manner (Ettarh 2018). Open science is therefore driven by a popularly held view of science as the collective pursuit

of a unified and unambiguous understanding of nature. This general vision of science considers knowledge to accumulate on a grand, global scale. Science is thought to inform technological change in a way that reflects arbitrarily defined technological scales of progress, which are inspired by the futures imagined in a particularly impactful cohort of post-war science-fiction stories (e.g., Arthur C. Clarke's *2001: A Space Odyssey*, Isaac Asimov's *Foundation* trilogy, Gene Roddenberry's *Star Trek*, etc). All of this colloquial imagery frames science as largely responsive to nature, and ignores how scientists construct data and develop new knowledge on the basis of the pragmatic circumstances, motivations, and experiences that shape the range of possible outcomes that derive from their situated actions.

This idealized vision of science is commonly illustrated using the data/information/knowledge/wisdom (DIKW) model of knowledge production, which relates basic and synthetic ways of understanding the world (Rowley 2007; Frické 2009). According to the DIKW model, representations of a natural truth (data) undergird more complex statements (information) which inform explanations (knowledge) and eventually contribute to intrinsic understanding (wisdom). Despite the implication of movement from one stage to the next, this model fails to account for how these transitions actually occur in practice. Moreover, the flow is assumed to be unidirectional up the pyramid towards a pinnacle of pure human thought. This resembles another popular metaphor in knowledge management, that of the oil pipeline, whereby data are presented as scarce natural resources that are harvested and gradually refined to create more stable and marketable products (Nolin 2019). Mining for data is characterized as visceral and material work that occurs close to nature, while refining and synthesizing are imagined as more mental and formulaic processes. Like the DIKW scheme, the pipeline model assumes that the starting point is a natural and free-flowing repository of truth, and that researchers must contain and channel it to give it greater value, while giving it artificial shape in the process (Puschmann and Burgess 2014). Any sources of friction that impede the flow of data are considered as obstructions that must be cleared or worked around to facilitate the development of more elaborate forms of understanding (Couldry and Yu 2018). At the same time, the systems engineered to channel information are meant to protect us, to ensure that we do not get swept away by the "data deluge", unmoored and lost at sea (Bell, Hey, and Szalay 2009).

This drives an obsessive concern with workflows pertaining to legal and logistical issues surrounding scientific publishing that open science advocates deem problem-

atic. Many open science advocates see publishing as the business of typesetting and copyright law, which they could render moot using automated publishing workflows and by encouraging use of open licensing agreements (Foster and Deardorff 2017; Harnad 1998). Viewed as merely technical systems, these could be resolved through technical means. The technocratic system imagined by open science advocates envisions a global web of information, whereby new forms of knowledge emerge through novel integrations (Tennant et al. 2020; Harnad 1998). If bits of data click together and are consistent with a pre-existing understanding of the world (which already clicks together), the new knowledge is deemed legitimate. Science is therefore considered to be self-correcting, since the act of assembling data to produce new knowledge is itself the means through which claims are verified or refuted. This parallels the means of evaluating contributions in open source software development projects, which emphasizes code's functionality as a primary factor. If code does not run, there must be a bug, or an inconsistency in the program, that renders it non-functional (Kelty et al. 2008: 220). Contributions to a collective code base are therefore said to be based on merit, or the skillful implementation of code, rather than according to the qualities of the programmer who committed the code (Coleman 2012: 121). This relates to the idealized conception of scientific knowledge production described above, in that contributions to a collective enterprise are considered to be disembodied, unambiguous and lacking positionality ascribed by the people who contributed them.

These transformations are genuine attempts to reify the adage that "information wants to be free", which implies that information is constrained by external domineering forces — namely, the arbitrary restrictions imposed by copyright law and the use of proprietary media formats and communications protocols — and that information can and should exist in a boundless state, which is assumed to be more natural (Harnad 1998). This bears an unsettling resemblance to techno-libertarian ideology in that each involves a spurious assumption that their key agents of concern are naturally independent and asocial beings, and that these isolated and atomic units may vaguely combine to form products of greater value, i.e. communities or states and knowledge, respectively. By ascribing value on the basis of market-based solutions ("the marketplace of ideas"), we assume that all actors within the system behave rationally and in accordance with the system's built-in assumptions (Wellen 2004: 110). In a world where digital communications platforms have come to resemble state institutions to a great extent (Gorwa 2019; Nieborg and Poell 2018), open science promises to enact a populist and anti-establishment vision for the future of scholarly communications,

as illustrated by Suber (2003), who remarked that the open science revolution is the start of a new era wherein "scientific communication can be in the hands of scientists, who answer to one another, rather than corporations, who answer to shareholders."

Numerous scientific disciplines, ranging from ecology (Parr and Cummings 2005), through earth science (Chan, Peters, and Tikoff 2016), to clinical research (Choi et al. 2013), have put out calls to develop open-data infrastructures designed to support data sharing and reuse. These calls tend to envision a utopian future, where data flows freely and humankind is more able to maximize its knowledge potential. However, upon even modest critical examination of what using these infrastructures actually entails, it is clear that cultural norms, and not just technical aptitude, will play a significant role in shaping the future of open science (Kling, McKim, and King 2003; Adema and Moore 2021).

1.2 Open data in archaeology

All of this colloquial imagery frames science as largely responsive to nature, and ignores how scientists construct data. This vision of science does not take into account the double hermeneutic that is characteristic of social science research methods, which considers researchers' roles in ascribing meaning to the objects that they identify and collect to begin with. And yet, the myth of unidirectional data production and processing persists even in archaeology, despite the discipline's strong tendency for critical reflection regarding its own practices (Sørensen 2017: 107). This is perhaps due to the practical and bureaucratic contexts within which archaeological research operates, namely the need to produce particular kinds of research outputs that require specific kinds of stable inputs. For instance, since the functional value of archaeological data is associated with their usefulness for generating the kinds of reports that archaeologists deem valuable, which are typically one-way forms of communication that contribute to an additive process of knowledge production (i.e. journal articles, book manuscripts, conference presentations, etc), anything else, including "unofficial" or non-authoritative perspectives and discourse, is commonly deemed extraneous for the purposes of formal analysis, and tend to be dismissed as a lower or less professional form of archaeological engagement, despite wide recognition of their value in theoretical discourse (Hodder 1989: 273-274; Joyce and Preucel 2002: 138-139). Thus, the information infrastructures and sociopolitical pressures that frame the value regimes of archaeological research together contribute to a particular vision of what data are

and how they should be acted upon.

It is also worth noting that this interest is largely oriented around digital applications, particularly in analytical contexts. Digital methods, by nature, require formal data as inputs, and open-data platforms, where data are processed, documented, and made available for formal analyses, are essential resources supporting this kind of work (Kintigh et al. 2014). These platforms, which often employ professional archivists and information technologists, effectively transform a project's data into tidy and accessible digital archives. In this way, open-data platforms serve as intermediaries between those who produce archaeological data and those who reuse them in secondary research contexts (Faniel and Zimmerman 2011).

Open-data platforms incentivize archaeologists to share their data by promoting the notion that datasets should be counted as citable research outputs, while also making it easier for researchers to access this data for their own use. However, this continues to present data as a held commodity that grants opportunities for career development on an individualistic basis, and runs counter the communal spirit espoused, but not necessarily enacted, by open data advocates (Bevan 2012).

Moreover, these platforms advance a mechanistic or linear framework that perpetuates the implicit notion that the archive is a natural resting place for data. This sense that data are stable records of archaeological observations is necessary to instill confidence in analysis based on them. However, mistakes happen, people reinterpret finds that have already been accounted for, and feedback prompts informal references to previous work that does not always make it to shared spreadsheets (Voss 2012). Open-data publishing platforms do not adequately consider how data and the methods of acquiring them change, and offer no reliable mechanisms for correcting, critiquing, or otherwise editing published datasets (Bevan 2015). Accounting for these features of archaeological research would complicate the often promoted benefits of the data publishing model, namely that it supports the validation of data and that data are maintained persistently to ensure their authenticity, as considered from a digital curation standpoint.

1.3 Data sharing in practical context

Open data platforms, which host published datasets on the web, boast several potential benefits, including the ability to extract untapped value from older "legacy"

data, to integrate data collected at various archaeological sites, to validate analytical claims more effectively, and to ensure that the general publics who fund archaeological research are able to access freely and make sense of the fruits of their investments (Kintigh et al. 2014; Kansa, Whitcher Kansa, and Arbuckle 2014). However, as the open data movement matures and data-sharing platforms become integral parts of the publishing process, archaeologists are becoming more aware of their limitations.

For instance, Huggett (2018) reports on how open data platforms have generally failed to encourage reuse, Opitz et al. (2021) demonstrates how effective data integration and synthesis is primarily derived from preexisting collaborative relationships (Opitz et al. 2021), and Cook et al. (2018) and Cook (2018) shows how impactful public engagement and education using open data requires some degree of professional interpretation tailored for specific audiences. Furthermore, Gupta et al. (2023) and Fisher et al. (2021) call for archaeologists to prioritize Indigenous communities' rights, desires and values when exposing protected information, and encourage archaeologists to enact the CARE principles (Collective benefit, Authority to control, Responsibility, and Ethics) which were recently devised to mitigate against potentially harmful data publishing practices.

That these concerns were raised in response to the initial implementation of open data norms and practices hints at their foundation upon a nominal view of data as asocial, apolitical, and disembodied entities, which is fundamentally not accurate (Huggett 2015b, 2022). While open data hold enormous potential to re-shape how archaeologists work, they generally fail to account for how they might fit into or alter existing value regimes and forms of professional interaction.

In order to unlock this potential, we need to broaden our imagination of what data sharing actually entails. Data sharing is not simply uploading and downloading formally arranged information to and from a digital repository, but is in fact wrapped up in social processes and structures. Moreover, archaeologists share data all the time through non-digital means and in more private settings, following social and technological protocols that do not necessarily involve making the records available 24/7 on the web. It is important to examine data sharing in all its forms and relations as a fundamentally social experience, or as series of collaborative commitments among involved stakeholders.

This was more adeptly articulated by Dallas (2015), who identified any archaeological activity as an act of curation, or something that involves reconciling with past

decisions and anticipating future work. Archaeological epistemic culture, or sense of professional solidarity, helps us to do consider these aspects of work and make such work practically actionable. Passing research outputs on to archivists represents a boundary crossing where the information becomes sanitized and re-represented in a way that gets in the way of these acts of reconciliation. Perhaps this explains the contrast in character between researcher-led and archivist-led data curation efforts.

Simply making data available on the web, perhaps supported by formal documentation, is not enough to breathe new life into old data. Archaeologists apply a great deal of work to make data work for new purposes, which typically entails reconciling differences between disparate datasets and between each dataset and the new objectives that they were never originally meant to address (Cooper and Green 2016). The productive integration of perspectives and practices is in fact supported by both social and technological systems that help coordinate labour and information produced thereof. Acts of communication are socially motivated and circumscribed, and archaeologists share information in different ways based on the circumstances (Thorpe 2012; Caraher 2022). Archaeologists are more able to parse shared information when they understand the underlying situated experiences that contextualize the creation of transmitted messages (Faniel et al. 2013: 299-301). This context is not typically formally encoded in transmitted messages, but is shared through subtextual cues and alternative forms of personal communication that surround the formal document (Fotiadis 1992; Goodwin 1994). For instance, Huvila, Andersson, and Sköld (2022) noted how references to methods literature in archaeological reports convey a variety of meanings to readers, and readers' ability to understand these meanings depends on their awareness of the professional contexts that surround the writing of these reports. How might we more effectively capture and communicate this contextual information? Is this even feasible under the predominant technosolutionist view of science described above?

Morgan and Eve (2012: 523) remarked that "we are *all* digital archaeologists" in that all archaeological work relies on and is embedded within digital systems. But beyond that, archaeologists are now also, in some way or another, information workers. This is evident by the fact that archaeologists set up and interface with their own bespoke information and communications systems, plan, compare, document, and critique each other's data models, and account for how their data may be accessed, interpreted, and reused in contexts that reside outside the original scope of work. While the enthusiasm for doing all of this additional work varies from project to

project, archaeologists have undoubtedly become more aware of the need to carefully consider how they represent the information they produce, and to be mindful of factors that impact how their data may be accessed and used. This dissertation articulates and reorients archaeological data management, and data sharing in particular, toward a new discursive paradigm that is more conducive to addressing archaeologists' needs and desires.

1.4 My approach

This dissertation recasts archaeology as a continuum or network of practice, as opposed to a segmented linear progression or research cycle. This entails taking a pragmatic approach to understanding the situatedness, historicity and social contingency of archaeological work. Moreover, I consider data work as omnipresent throughout all kinds of archaeological practices, and intrinsically embedded within social and professional experiences, and linked to the production and perpetuation of norms and expectations regarding how information commons are governed. I conceive data work, broadly speaking, as the transformation of meanings from one set of activities to another via the materialization of information objects, such as recording sheets, reports, diagrams, finds bags, tags, scrap notes, descriptive monologues, stories, demonstrations, among many other entities exhibiting various degrees of tangibility and stability. This suits my interest in articulating the ways in which expressions of archaeological meaning are valued and how archaeologists actively create information objects that exhibit such value.

I frame data as discursive media, and data sharing as acts of collaboration, or as means of communicating varied archaeological encounters among invested stakeholders. This has implications for how we think about archaeological collaboration both within and between project collectives, and helps account for the problematic rollout of open data infrastructures, particularly their lack of actual meaningful use. My work articulates the ways in which archaeologists already share data, which do not necessarily rely on the global information infrastructures that "open archaeology" is concerned with developing. More specifically, I call attention to the collaborative commitments that acts of sharing entail, and the roles of mediating technologies in these interactions. I thus relate local cooperative experiences with the advent of large-scale, web-based digital infrastructures associated with the open data movement, which pose novel sociotechnical arrangements that are, in some ways, in tension

with existing professional norms and expectations concerning data sharing and reuse.

In emphasizing the fact that data are produced by people, I would highlight that data management involves regulating people's actions, and that the management of data and of labour are inherently intertwined. Consequently, the mechanisms that control how labour is conducted bear broader epistemic implications regarding the nature and use of evidence in our reasoning about the past. This fits into a broader critical perspective on open research infrastructures, which re-arrange the social relations that frame the performance of archaeological work. I critically evaluate the mediating devices that occur throughout the continuum of archaeological practices, and characterize them as points of convergence where collaborative commitments are reified and reproduced.

We can leverage these insights to develop information systems and governance strategies that enable more effective means of communication, and that foster the extension of established collaborative commitments beyond the scope of archaeological projects as they are presently conceived. In other words, my ultimate goal is to help develop a more socially-mediated open data paradigm that is specifically suited for archaeology.

1.5 Research Questions

In this dissertation, I articulate the social and technological structures, processes and practices that give shape to archaeological data and that give them professional and epistemic value. I examine the multitude of activities that operate in tandem throughout the course of archaeological projects, which produce a variety of information objects drawn together by information systems. By doing so, I detail how diverse ranges of archaeological outlooks are melded into cogent knowledge regarding the past, connecting the chains of translation and evidence-building that result in what we call archaeological knowledge.

I explicitly frame all archaeological work as that which involves the transformation of meaning between contexts, following Dallas' (2015) notion of curation. This is true of both local, private, and informal means of collaboration, and formal means of sharing data at scale, among strangers, and via the web.

Since archaeological knowledge is the product of embodied decisions, experiences, and outlooks, knowledge commons should account for these crucial social facets. I

turn to contexts where these factors already play a role in fostering meaningful collaborative connections, such as individual archaeological projects with bounded membership and scope, to understand the role of social connections in the collection, management, and sharing of archaeological data.

More specifically, I ask:

RQ1 How do archaeologists, who work at different points in time and space, and who engage with various kinds of evidence in a multitude of ways, manage to produce stable outcomes?

RQ2 What is the nature of the social and technological systems that archaeologists implement to support distributed work, and what are their practical and epistemic implications?

RQ3 How do archaeologists reconcile novel sociotechnical arrangements introduced by data management infrastructures with existing ways of working?

RQ4 How do we account for the embodied decisions, experiences, and outlooks that contribute to the constitution of archaeological knowledge as we continue to develop large-scale data sharing infrastructures?

1.6 Summary of chapters

This dissertation is written for archaeologists and scholars of scientific practice alike. It incorporates a unique outlook derived from my interdisciplinary perspective, and I have structured it in a way that communicates my own approach to the subject matter.

Chapter Two outlines various ways in which archaeologists conceive of their data and describes the varied roles that archaeological data play in the production and validation of knowledge about the past. I address how archaeologists have settled on a certain formal notion of data, and highlight its relationship with the advent of digital archaeology as a distinct field of research and the development of archaeological information infrastructures. I then describe the recent emergence of epistemic tensions originating from contradictory notions of data, and present an alternative, discursive notion of data as a viable way of resolving these tensions.

Chapter Three describes several theoretical and methodological frameworks that

inform this dissertation. As a meta-disciplinary study of research practice, this study articulates how archaeologists conceptualize and act out collaborative actions. I outline certain theories of socially-situated cognition and action and highlight how I incorporate them in my applied approach.

Chapter Four describes the methods and materials I rely on to fulfill this study. I describe the cases from which I collected my evidence and the basis for selecting these particular case studies, and discuss the kinds of data I work with. I present the qualitative research design and describe my research ethics protocol.

Chapter Five identifies various domains of archaeological work, including project management, fieldwork, specialist activities, data management, and other adjacent aspects of research such as engagements with research communities, general publics, and elements of research administration and infrastructures. I account for series of work roles, tools, modes of interaction, aspects of research environments, and held values associated with each domain and ascertain the general field of power relationships within each field and among fields.

Chapter Six then goes on to explore the discursive relationships involved in various archaeological practices. I focus on how archaeologists capture and process information, and how these processes mask certain epistemic and professional commitments and value regimes.

Chapter Seven discusses certain tensions that emerge from these activity-oriented relationships. I articulate the combined social and technical aspects of research practice, as they pertain to data management specifically, and highlight power dynamics inherent in these systems.

Chapter Eight concludes by summarizing my findings and demonstrating how they address the research questions. I also discuss the potential outcomes and implications of this work, specifically regarding future development of infrastructures in support of open archaeology.

Chapter 2

Meanings and Values Associated with Archaeological Data

Archaeological data are an omnipresent aspect of archaeological research, in that they enable archaeologists to make meaningful and authoritative claims about the past. However, notions about data and their role in knowledge production vary across contexts where archaeological research occurs. In this chapter, I review conceptions of archaeological data and data work in contexts of acquisition, analysis, and dissemination, in which data play different functional roles. I draw attention to epistemic tensions that emerge from these discordant perspectives on data, which are explored in depth throughout this dissertation.

I use these epistemic tensions to situate this thesis within a body of work that is primarily concerned with discursive and communicative aspects of archaeological data. This approach considers data as mediating devices that support research by connecting experiences distributed across time, place and community. Archaeologists working with data must therefore reconcile the circumstances under which data were created and the potential outcomes that they desire and deem feasible to achieve. In other words, working with data involves participating as part of a continuum of practice, whereby one's work is impacted by prior actions and has the potential to influence future outcomes. I frame these connections as collaborative commitments, which govern professional relations among members of research communities and which contribute to systemic norms regarding what data are and how they should be valued.

2.1 Data in contexts of collection and capture

Archaeological data are records that encode objects' characteristics, properties or features in ways that render meaningful aspects communicable among actors (including humans and non-humans) who share common points of reference. In other words, data identify, record and format information about objects or phenomena and their relevant properties, which enables knowledge about them to circulate and form the basis for extended avenues of knowledge production. Data may comprise written records written in various styles (recording sheets, spreadsheets, field notes), various forms of visual media (sketches, scale drawings, photographs, 3D models), or information collected through use of specialized sensing equipment designed to identify objects' physical, chemical or biomolecular properties (magnetometer, X-Ray Fluorescence [XRF] analyzers, tools and protocols for sequencing ancient DNA, etc) or spatial positions and relationships (theodolites, LiDAR, etc). Moreover, data are sometimes derived or recombined from published sources in ways that generate original value. Data conceived in this way are considered to be accurate descriptions of things in the world, whose ontological properties align with objects' natural features, which are selected for due to their ability to be precisely described using standardized scientific methodological procedures.

Despite the varied contexts and circumstances in which data are produced, archaeologists tend to identify data as resulting from fieldwork, since this is typically where they first encounter archaeological objects and phenomena (Carver 2010: 36). Moreover, since the act of collecting archaeological materials necessarily involves removing them from their archaeological contexts, fieldwork relies on recording systems that enable comprehensive description and association of various kinds of archaeological entities. These factors have contributed to fieldwork being a primary locus through which archaeologists explore the nature of archaeological understanding and meaning-making.

My main goal in this section is to emphasize the pragmatic means through which archaeologists produce data. I highlight prior theoretical work on the nature and value of archaeological data, especially in contexts of initial archaeological encounters, and then review work that critically examines how data acquisition is influenced by social context. Finally, I highlight potential epistemical conflicts between this pragmatic orientation in contexts of data acquisition and an alternative view concerned with maintaining stable chains of inference held in contexts of analysis, which is addressed

in the following section.

2.1.1 Re-framing "data" as "capta"

In the context of fieldwork, data are said to be "collected" (Petrosyan et al. 2021; Buccellati 2017: 234), which implies that archaeologists are responsible for finding objects and phenomena that exist in a relatively wild or unobserved state, and retrieving them for further study in more ordered and structured research environments. This is concordant with the notion of "raw" data, which refers to observations made at the moment of the archaeological encounter, which have not been subsequently processed or modified in ways that are thought to add interpretive baggage (Huggett 2022: 281). This contrasts with more critical perspectives that acknowledge underlying assumptions and commitments that affect the constitution of archaeological data. Carver (1989, 1990) and Hodder (1997, 2000) were among the first to articulate clearly the subjective aspects of archaeological recording by explicitly acknowledging the roles that archaeologists play in the creation of the archaeological record, rather than as those who merely document materials whose meanings are singular and fixed by the phenomena that generated them.

Moreover, Chippindale (2000) proposed an alternative way to think about how archaeologists account for and record information that forms the evidential basis of archaeological knowledge, by re-framing "data" as "capta". More specifically, Chippindale (2000: 607) suggested that archaeologists should more readily acknowledge the "relationship between the data we will address and the archaeological affair for which understanding is desired," which highlights the pragmatic and motivated experience of obtaining information. Drucker (2011) expanded on this by stating that "data are capta, taken not given, constructed as an interpretation of the phenomenal world, not inherent in it". Huggett (2022: 276) further summarized that, from a capta perspective, "data are not the start of the process but a consequence of multiple decisions, predeterminations, and perspectives which precede the moment of capture and impose constraints on the observations recorded as data". Similarly, Banning (2020: 5-6) draws attention to the fact that archaeological data are products of human decisions and biases, and that their qualities, which bear traces of the pragmatic circumstances and potential value imagined by their creators, influence what can be done with them.

In other words, the notion of capta situates archaeological sense-making in relation

to goal-oriented apparatus of knowledge production, through which information is assembled and applied to form more coherent knowledge. Reframing data as capta therefore involves highlighting the targeted and reasoned approach at the moment of the archaeological encounter by people wielding physical and conceptual tools that hold their own affordances and limitations, whereas the more prevalent notion of data involves a more passive experience whereby material is swept up in its raw state and granted purpose and meaning during subsequent phases of analysis.[1] This aligns with Wylie's (2010: 316) conception of archaeological knowledge construction, which considers how archaeologists recognize particular aspects of an object as meaningful based on the knowledge and understanding that they accumulate during their lived experiences, and design systems for capturing and describing these features in ways that conform to their understanding of their relevance and value. In other words, the application of prior observations captured through data amounts to a reconciliation between the circumstances of their creation and the potentials that they afford (Wylie 1989, 2017). Framing data as capta contributes to my outlook, explained in Section 2.4, that data also serve to connect chains of pragmatic activities, and therefore operate as discursive media that relate different socio-technical situations.

2.1.2 Situating data collection within social contexts

Gero (1985, 1996), Politis (2001), and Wylie (2003) extended this constructivist line of thinking, which highlights the impacts of archaeologists' decisions and actions in the formation of archaeological data, by examining how aspects of archaeologists' identities affect how records are constructed and valued, specifically by acknowledging gendered and neocolonial aspects of recording practices. For instance, Gero (1996: 268-269) noted how archaeological entities that are excavated with more well-defined and concrete boundaries, which the author associates with a masculine "pattern of practice," are more likely to be drawn into a prominent position in the project's apparatus of knowledge production.

Zorzin (2015), Thorpe (2012), and Caraher (2016) also related recording strategies

1. This may relate to an additional meaning of the similar term "capture," which is primarily associated with generating photographic images (Richards-Rissetto and Landau 2019), but which is also commonly applied to describe other tactical acts of sensing, such as technical drawing (Morgan and Wright 2018; Morgan et al. 2021), photogrammetry (Waagen 2019; Olson et al. 2013), remote sensing (Crutchley and Crow 2018), and use of digital theodolites (McPherron 2005; Martínez-del-Pozo, Mayoral-Herrera, and Ortiz-Coder 2013), all of which involve live procesing of visual cues to create useful images, thereby situating acts of observation within targeted and systematic analytical protocols and systems set up to support them.

with the sociopolitical and economic circumstances under which archaeology operates, by problematizing the means and pressures for increasing efficiency as driven by capitalist mentalities and profit motives. For instance, Thorpe (2012: 32) argues that an industrialized archaeology "at best restricts and at worse removes the opportunities for the excavator to explicitly interpret that which they have dug" and "discourages active links ... between excavator and specialist in the processes of excavation and assessment and research".

Others including Goodwin (2010) and Edgeworth (2003) have taken a more observational approach to investigating archaeological data construction in fieldwork settings. For instance, Goodwin (2010) demonstrated how archaeological meanings are negotiated within situations of unequal understanding and hierarchical rank through the implementation of mediating physical and conceptual tools. Edgeworth's (2003) ethnography of archaeological practice highlighted the subtle negotiations that occur as meanings are ascribed to objects of interest as they are recognized by individuals holding different roles in a project and who occupy different methodological domains.

All of these works explicitly situate archaeological data as aspects of a social system, which are rife with complex power dynamics. Similarly, this thesis situates archaeology within the broader world around it, and connects the enaction of specific practices to underlying assumptions and commitments pertaining to archaeologists' existence within the wider world.

2.1.3 Epistemic anxieties

Although archaeologists now commonly acknowledge the theory-ladenness and subjectivity of their data, there is also practical value in maintaining an image of data as stable and decisive expressions of reality, which encode real phenomena in ways that simplify them and make them easier to transmit, manipulate, and serve as the evidential basis for analysis (Huggett 2017; Batist et al. 2021: 1740). For instance, in their critique of formal representations of archaeological objects and phenomena, Hacıgüzeller et al. (2021: 1710-1712) highlighted the sense that more formally structured data are more objective and neutral representations than narrative or situated accounts, and more readily lend themselves to analytical protocols that are commonly framed as being more rigorous and scientifically sound. Huggett (2022: 276-278) suggested that this is facilitated by digital tools, interfaces, and workflows, which apply a "distancing effect" by back-loading the apparatus and motivations of data capture to

standardized and automated systems, and which foster a sense that data are stable as they emerge from archaeological contexts by side-stepping acts of decision-making at the moment of the archaeological encounter. This contributes to what Wylie (2017) and Lucas (2019: 55-57), and Huggett (2022: 274-278) call a sense of "epistemic anxiety," whereby archaeologists simultaneously consider their data to be both objective and decisive, as well as subjective and situated, depending on the contexts in which they are addressed or applied. This sense of anxiety reflects archaeologists' present inability to make sense of data's shifting roles in various aspects of archaeological work, for instance, from contexts of data collection and capture to contexts of analysis.

2.2 Data in contexts of analysis

As records made about objects and phenomena of interest, and that can be consulted, accessed or used as stand-ins for the objects that they have been constructed to represent, archaeological data lend themselves to analysis, or detailed examination of an object whose aim is to understand more about it, namely aspects of the object that can not be inferred through direct observation. Two interdependent aspects stand out in this vision of the interplay between data collection and analysis: (1) data are fixed and stable, and (2) data are generated prior to and separate from the analytical processes. In other words, archaeological data are made to take on a role as "immutable mobiles" as described by Latour and Woolgar (1986: 76), whereby information is separated from the circumstances through which it was created, and is therefore made to speak for itself. This disconnect between processes of data collection and processes of analysis, as manifested through distribution of tasks across time, place and situation within the research community, is thus means of effecting intentional ignorance concerning the circumstances through which data come into being. This has the effect of rendering data as authoritative statements that are accountable only to the entities that they are made to describe, which contributes to a notion of scientific legitimacy that rewards those who seemingly present the world as it is, in an objective manner, and whereby objects hold meanings independent of the contexts within which the research was conducted (Daston and Galison 1992). Archaeological data thus serve not only as descriptions of objects and phenomena of interest, but as evidence that ground analysis, and interpretations and explanations derived thereof, in reality.

In order to maintain robust chains of inference, which are necessary to validate

claims derived through analysis, archaeologists rely on prior knowledge about the predictable properties of materials and behaviours, as informed by verified observations and theories (Wylie 1989: 15-16). In other words, entities under analytical scrutiny are made to fit within established models of natural and social behaviours (Clarke 2014; Schiffer 1988; Gardin 1989). Moreover, these models are built into archaeological recording strategies, in that archaeological objects are distinguished as discrete entities and are categorized based on the kinds of analyses that may be performed on them (Holdaway et al. 2019; Carver 2010: 36). Archaeological workflows, particularly those that rely on digital mechanisms, establish disciplined ways of working and channel information along preformulated pathways in service of these desired analytical approaches.

It is thus quite difficult to disentangle notions of data from digital systems and the kinds of analytical methods that they enable. Computers' effective ability to store and process formally structured information is particularly instrumental to systems, statistical, and spatial analytical approaches, which Kristiansen (2014) identified with a scientific (rather than humanistic) theoretical outlook and which he (among others, notably Olsen (2012), Sørensen (2017), and Huggett (2015a) considers to be undergoing an intense phase of interest under the label of "digital archaeology". Digital archaeology is generally defined by the digital tools and media that it uses, but during the formative years of the most recent wave of interest predominantly involved analyzing large, integrated datasets, and was dominated by implementation of network analysis and Geographic Information Systems (GIS) distribution studies. These methods claimed to be "data-driven" and focused on "relational approaches" to archaeological phenomena at broad scale, but notwithstanding the vagueness of these terms, all archaeological research is in fact informed by data, involves comparison among related and divergent finds, and deals with phenomena observed at societal scales (Huggett 2015a: 88). However, digital archaeology was distinguished by a specific set of analytical methods that relied on formal data, which were used to define formal relationships among archaeological entities. To practitioners of these digital methods, data meant *formal data*, or data that are recorded or collated in a consistent manner, motivated by a need, desire or warrant to render them comparable.

To pursue these means of analysis, Kintigh et al. (2014) and Kintigh et al. (2015: 4-5) argued that archaeologists must be supplied with consistently formatted and well-documented data, and rallied for increased investment in information infrastructures to facilitate this. Archaeological data services, which provide archival services to en-

sure that the information outputs derived from archaeological research are preserved and made accessible for extended use, have thus become prominent stakeholders in the development of digital archaeology (Richards et al. 2021). Archaeological projects that operate using public funds or that are bound by specific policies mandating sustainable record keeping practices are often required to deposit their data in digital archives (many of which are operated by data services), which accession and preserve digital files according to standard archival practices (Kansa 2012: 502-503). Once deposited in a digital repository, which serves as stable archives or natural resting places for data, data are considered to be "final" and "locked in" to the "official" archaeological record (McKeague et al. 2020; Cooper and Green 2016; Costa et al. 2013). These data are then made available for reuse, or analysis designed to address secondary research questions not considered in their original contexts of creation (Kansa 2012; Richards et al. 2021; Wright and Richards 2018). Archaeological data services thus operate on two primary fronts: by engaging with archaeological projects to facilitate data deposition in their archives, and by making the materials they host amenable to be worked with in contexts of reuse, particularly in service of digital archaeology research methods, while incorporating and perpetuating certain assumptions regarding the divisions between data collection and data analysis, namely regarding what constitutes a complete and stable dataset and what is needed to perform analysis (Kansa 2014). While it is difficult to take issue with their overall aims of enhancing the value of research data by making them more openly accessible, the practical value afforded by archaeological data services is questionable, as will be discussed below (cf. Huggett 2018).

2.3 Data in contexts of sharing and reuse

As described above, analysis sometimes goes beyond the scope of a particular project, in which large volumes of information drawn from multiple sites are integrated into broader datasets. Archaeology data services play a major role in this kind of work by acting as interlocutors between projects that produce data and analysts who reuse them. The notion of "legacy data," or data that are made available after a project is complete, has emerged to reinforce the sense of finality associated with depositing data in an archive (Quinn and Fivenson 2020). This reflects certain norms regarding how archaeological projects operate, namely that projects end and that their ending renders a dataset complete. Open data platforms position themselves as institutions where legacy data can be cared for and given new purpose, freeing archaeologists to

move on to new and exciting work (McManamon et al. 2017).[2]

Data reuse is often characterized as being oriented towards the use of computer-based methods, situated at a desk, separated from fieldwork and unaffiliated with the projects from which the data derives. Although there are many ways to extract value out of legacy data (cf. Wylie 2017), they are thought to be particularly useful in research that addresses the emergence of broader-scale phenomena that could not be adequately considered using a single dataset in isolation (Kintigh et al. 2014: 16). Data integration is a key challenge, since it requires that the different methods and protocols applied to create each dataset be reconciled among themselves and in relation to the new and unanticipated research questions they are now being made to address (Sobotkova 2018; Huggett 2018).

Efforts to make data comparable across projects (cf. Kintigh et al. 2015; Whitcher Kansa 2015; Niccolucci and Richards 2013; Gergatsoulis et al. 2021) tend to emphasize technical means of reconciling different perspectives, which are framed as collectively or institutionally held, as expressed through documentation made available alongside data or as part of publications and reports. Data documentation can take several forms and include various kinds of information. For instance, certain repositories require that projects summarize their datasets, outline the methods involved to generate them, and situate them in relation to the project's overall mission. Projects may also be required to precisely define the meanings of certain key terms, and formally relate these terms to entries in controlled vocabularies (Isaksen et al. 2010).

However, archaeologists who both produce and reuse data recognize that there is usually more to the story than what is captured in these formal documents, and actively seek ways to provide and seek out greater context. Archaeologists depositing their data in digital archives often exhibit a sense of apprehension deriving from a professional fear that data will be used to perform analyses that the creators have not yet published, which may be dealt with by waiting to archive data only after all of its analytical value has been extracted (Strupler and Wilkinson 2017: 294-295). Another source of anxiety is a concern that the data will used in a way that the creators consider to be discordant with their intentions; there is no guarantee that secondary analysts will read or properly understand any documentation that accompanies a dataset, and a dataset's creators may be apprehensive about passively contributing to research with which they take issue (Opitz et al. 2021; Fredheim

2. The resemblance to geriatric care facilities is quite conspicuous, and likely shares similar roots in neoliberal attitudes regarding institutional forms of care.

2020). Archaeologists also recognize that the documentation mandated by archival policies may be of limited value or fail to capture the genuine meanings of their work (McManus 2012; Huvila 2016); much of the crucial context that informs readers about the how archaeological data were created is in fact informally documented and scattered throughout field reports (Huvila, Sköld, and Börjesson 2021; Huvila, Börjesson, and Sköld 2022). On the other side of the archive, data reusers often express a desire for information that would only be readily available to those who created them, and seek more contextual information that would not necessarily be written and formally documented (Faniel et al. 2013; Atici et al. 2013: 676-677; Kansa and Whitcher Kansa 2013: 90-91; Chapman and Wylie 2016: 213). Edwards et al. (2011) observed similar phenomena in non-archaeological research contexts, whereby informal conversations about data were necessary supplements to make data useful. Edwards (2011: 684) likened metadata to precise parts in a Swiss watch that must be painstakingly polished and engineered to reduce their coefficients of friction, whereby informal means of communication serve as lubrication that overcome friction by filling the unavoidable coarse gaps within a heavy machine "running fast and hot".

All of this suggests that both producers and reusers of archaeological data are not satisfied with the new kind of collaborative commitment that emerges from this novel arrangement. In response, archaeologists seek ways to break down the barrier between data creation and reuse, either by performing all data analysis prior to engaging with the archive at all, or by establishing informal channels to communicate around the system (Faniel et al. 2013: 299; Huggett 2018: 98-99). It is quite ironic that the formal and transactional protocols meant to streamline mutual comprehension of a dataset reveal their own inadequacy for achieving their stated purpose and the strengths of the system that they are meant to replace, as I previously articulated in Section 1.3.

2.4 Data as discursive records

Archaeological data are documentary records that enable research to be extended across time and place, and to be carried out in a collaborative manner. The media upon which data are inscribed enable direct experiences with objects and phenomena of interest to be shared and acted upon in alternative research contexts. Moreover, archaeologists rely on physical and informational infrastructures, and establish organizational practices, to normalize the information that they produce and to enable these records to be accessed, understood, and put to practical use. Archaeological

data are therefore also understood as discursive devices that enable work which relies upon various methodologies and theoretical outlooks to converge, and which help stabilize and legitimize archaeological knowledge.

This discursive notion of archaeological data is well represented in prior discussions of how archaeologists produce knowledge. Hodder's work on reflexivity, and specifically his encouragement of experimental ways of arriving at stable representations of archaeological objects and phenomena at Çatalhöyük, is particularly noteworthy. Building upon his recognition of the hermeneutic relationship between theory and practice, Hodder developed ways to render them more explicit by applying novel means of mediating and transmitting information: finds specialists and analysts were encouraged to participate in site tours to gain a more intimate understanding of the objects they would be working with and to obtain insights from those responsible for recovering the materials in the field (Hamilton 2000); field notes and sketches were posted in common areas, with open invitations to comment and respond with alternative perspectives (Berggren et al. 2015: 437); excavators, who used tablet computers to enter data directly into the database, were able to access analytical findings to inform their work (Taylor, Lukas, and Berggren 2015; Taylor et al. 2018; Berggren et al. 2015); and the project's database was designed to encourage recording different outlooks pertaining to objects of mutual interest (Mickel and Meeks 2015; Lukas, Engel, and Mazzucato 2018).

However, Chadwick (2003: 102-103), Lucas (2012: 72-73) and Sandoval (2020: 26) questioned this approach by raising concerns about the omnipresence of and confidence in advanced and potentially intrusive recording techniques, such as documenting excavators inner thoughts or formally identifying converging perspectives upon objects of mutual interest, as means of working out this problem. Sandoval (2020: 36-37) doubted whether the adoption of these new media was valuable in the absence of an informed method for producing them, while Chadwick (2003: 103) pointed out that the technological systems used to capture all of these novel insights did not adequately foster a will to participate in the kinds of work it was demanding of people, while also perpetuating the traditional and hierarchical social order pertaining to acknowledging and crediting labour in archaeological projects.[3] These critiques characterize the problem that reflexive strategies attempt to resolve, i.e.

3. See also Beck (2000) and Thorpe (2012) for related insights on the impact of socio-political context and informed implementation of advanced excavation recording strategies, though not as explicitly related to notions of reflexivity.

the entanglement of practice and theory, as impossible to mitigate, and identify the inherent situatedness of archaeological records as something that should be accepted as a fundamental aspect of archaeological epistemology rather than something that needs to be reduced or eliminated. For instance, Lucas (2001, 2012, 2019) went on to more comprehensively characterize archaeology as a materializing process, whereby objects of interest are transcribed as information objects with the aim of constructing comprehensive archives, which are accessed by stakeholders with varied interests and who seek different kinds of value from them.

Similarly, Dallas (2015) defined a notion of archaeological curation to describe the simultaneous acts of interpretation and re-presentation that are inherent in all archaeological practices, which occur continuously across research contexts, and which rely upon mediating devices to enable collaboration and communication. Dallas (2015) asserted that engaging with any archaeological documentary record necessarily involves actors relating their perspectives to those held by others, and squaring their own needs and expectations with the motives, methods, norms, procedures, and tools adopted in other actors' engagements with objects or phenomena of mutual concern, and which have impacted or will impact the formation of records held in a communal repository. In other words, archaeologists continually produce and reproduce meanings through a series of semantic negotiations, which occur as they re-interpret and re-present archaeological objects and phenomena in accordance with renewed sets of affordances, limitations pertaining to each encounter. Because archaeological data are often collected in large volumes and take a lot of time and labour to assemble, this approach prioritizes concern with the social and communicative aspects of research practice.

Thinking of archaeological research as a continuum of distributed practices draws out a greater appreciation for the ecologies of knowledge production involved in the creation and curation of archaeological data. This is reflected in work that documents archaeological practices in a sociotechnical manner, which frames the construction of archaeological knowledge in relation to the social structures and value regimes in which archaeologists are situated, and which consider science as active cultural practice rather than as rational and responsive decision making (cf. Edgeworth 2003; Huvila 2018; Caraher 2022). These critical examinations of archaeological research practice are reminiscent of work performed in Science and Technology Studies (STS) and Sociology of Scientific Knowledge (SSK), particularly studies of distributed action that relate epistemic activities as part of situated experiences involving an array of

non-human actors and information objects (cf. Suchman 2007; Latour and Woolgar 1986; Knorr Cetina 1999).

This way of thinking about research practice has led to greater attention to how archaeologists produce, maintain and use data. Previously, dealing with data has been an entirely new beast, and the epistemic issues surrounding the implementation of new technologies that they wield have been swept under the rug. More recently, digital archaeology has begun to recognize these issues as it has matured, and has rapidly transformed itself from a field that deals in the novelty of new technologies into a field that recognizes and highlights the disjunctures and discontinuities inherent in digital transformations (cf. Huggett 2015a; Graham 2019; Morgan 2022; Ward 2023). This recent wave of critical work focuses on the substrates within which archaeological practices are situated and upon which they depend. Rather than thinking about the nature of reality and our ability to know it, this discourse is now largely concerned with how archaeologists pragmatically recognize and reify archaeological phenomena, as constrained by certain inherent qualities or tendencies. Critique often centres on infrastructural or socio-technical issues, or the ways in which individual outlooks, instances or efforts are mediated, managed or generalized across, among or between domains. In practice, this culminates in critical evaluation of archaeological workflows that support the construction and transmission of data.

These concerns are also sometimes expressed using relatively unconventional forms of scholarly communication, such as blogs and social media. Many archaeologists who regularly apply digital methods in their work use these less formal venues to convey aspects of their research that they would not otherwise present, such as recollections of the difficulties they faced or the glitches that they encountered as they progressed along their digital workflows (Graham 2019: 84-85). Moreover, they openly invite other scholars and laypeople alike to engage with and co-construct ongoing projects through digital methods of communication and collaboration. Digital archaeologists post informal reflections on blogs and share pointers using social media, which rarely result in a formal or stable end product (Richardson 2015; S. Perry 2015; Caraher and Reinhard 2015). This is driven by a desire to help others do similar things and gain similar value from their own work. There is a recognition that the technological systems that support this kind of work are hard to manage, so people share their resolutions and engage in dialogues that may also serve to document their processes. These personalized and situated accounts of research practice recall the decisions to produce some kind of information output in ways that are comprehensible to other

archaeologists who deal with similar challenges. This informal way of documenting archaeological reasoning enables researchers to account for the winding, meandering or nuanced ways in which data were produced, including failures, dead-ends and loose strings that rarely come to light.

These informal media are thus means of expressing the awkward tensions between the institutional demands of archaeological research and the reality of actually doing it. It is easy to forget that the concrete and precise representations of meanings that constitute written words, central as they are to how we commonly conceive of data as storable and transmissible digital records, are not language, but rather a means of expression that fixes meanings to the page after months of drafting and revision. The more ephemeral and conversational tone of blogging and posting, of talking with collaborators either in person or through global telecommunications networks, or of chatting in a pub between conference sessions, facilitates more honest expression of what's on people's minds between drafts. It is here, in the gaps between formal documents, that the situational reality of archaeological practices, including numerous forms of data work, becomes apparent, and where communal involvement in an archaeological epistemic culture enables members to communicate the instability pertaining to the media on which they rely.

In their pragmatist vision of archaeological reasoning, Chapman and Wylie (2016: 207) imagine archaeologists coming together to construct a tangled structure,

> bring[ing] to bear as many different types of expertise as are needed to appraise the security of each line of evidence on its own terms, as well as to assess the causal independence of the processes that generated the anchoring traces and the conceptual independence of the background knowledge and analytic methods that warrant their interpretation as evidence.

In other words, robust knowledge structures weave together multiple strands of evidence derived through collaborative cooperation, while devising a strategic plan foregrounds the strengths and limitations of various approaches and their suitability within the research context. Organizing work around communally held goals in such a manner is a crucial aspect of archaeological project management (Carver 2010: 335-336; Strauss 1988: 165), and we can thus define archaeological projects as communities comprised of actors with common commitments to particular research agendas. Worries about misunderstanding how these actors created a dataset, or about whether someone might misuse a published dataset, are therefore expressions of con-

cern regarding the possibility of performing analysis in secondary research contexts that truly complement the project's original vision.

These recent critical reflections on digital archaeology highlight a need to consider the epistemic frameworks and practical workflows through which we recreate, organize, process and use data (Huggett 2012: 212; 2022: 289; Dallas 2015: 192-193; Hacıgüzeller, Taylor, and Perry 2021: 1725-1726). In the context of thinking about archaeological data as communicative media, this must involve considering how collaborating stakeholders construct them through pragmatic, collective effort to draw out meaningful and authoritative knowledge about the past.

This dissertation joins numerous other studies that examine archaeological data as means through which cooperating individuals holding varying perspectives express, transmit and understand meanings of various kinds across different contexts. However, my work is also informed by a set of theoretical and methodological frameworks formed within a more interdisciplinary "science studies" tradition, which contribute to a more sociological outlook on archaeology as culture practice (cf. Pickering 1992). Moreover, this thesis is based on critical observations of actual research practices and careful dissection and comparison of attitudes held by individuals occupying different roles and performing various activities. This enables me to account for the systemic implications of collaborative research practices, which impact different people in different ways, and that archaeologists may struggle to identify or articulate. In Chapter 3 I briefly describe the theoretical and methodological frameworks that inform my approach and I highlight their value in the context of this thesis. Then in Chapter 4 I describe the methods I employ to carry out this research.

Chapter 3

Theories of Discursive Action

My research draws from various material-semiotic frameworks derived from Science and Technology Studies (STS) and Sociology of Scientific Knowledge (SSK), fields that are concerned with examining research as cultural practice, or as ways of understanding the world through a complex series of physical and conceptual interactions between humans and the objects that captivate their interests (Pickering 1992). I consider knowledge to be constructed through scholarly intervention, whereby archaeologists ascribe meanings to materials, delineate natural phenomena from cultural processes, distinguish signs of modern intervention from activities performed by the archaeological other, and select signal from noise. Knowledge is not created in a vacuum; it derives from prior knowledge and experiences that someone deems relevant to particular topics of research interest.

I rely on various theories of discursive action to articulate how archaeologists act alongside other people, tools and concepts within social and collaborative spaces. Although archaeologists' reflections on archaeological practice necessarily involve stepping back and observing the discipline from an alternative, distant perspective, studies that explicitly reflect upon their theoretical and methodological underpinnings and which situate themselves in relation to the wide array of alternative perspectives remain uncommon. The turn towards considering archaeological practice through a discursive lens, as described in Section 2.4, represents a significant shift in this regard, as much of this work comprises critical examination of archives, infrastructures and digital media, topics that are well represented in STS and SSK, albeit in alternative, non-archaeological contexts.

In this chapter I describe the frameworks that inform my work, including their underlying ontological commitments and their value to my research. In Section 3.1 I describe theories of situated and coordinated action, which delineate the actors involved in collective endeavours and locate agency in such distributed systems. In Section 3.2 I position this dissertation in relation to realist and constructionist heuristic perspectives, which afford different ways of modelling the systems I investigate. In Section 3.3 I identify Activity Theory as a framework that enables me to identify an activity's social and technological facets, and in Section 3.4 I describe the Distributed Cognition framework as a means of articulating the systemic implications of networked action. In Section 3.5 I describe the Situated Cognition framework as a means of relating activities within social circumstances, especially pertaining to learning, and in Section 3.6 I identify Social Worlds/Arenas Theory as a means to identify actors in relation to and among cooperative productive efforts. Finally, in Section 3.7 I situate this dissertation in relation to the STS/SSK discursive milieux, and synthesize my overall approach as a metadisciplinary study of scientific practice. As I show in Section 3.7 these frameworks share the idea that knowledge is produced in dynamic, social environments, with particular objectives in mind, and as constrained by real circumstances. This is key to my analysis because it encourages me to consider how archaeological decisions and actions are actually made and enacted, while accounting for actors' internal mindsets as well as local and systemic factors that influence archaeological work.

3.1 Modelling situated and coordinated action

Researchers rely on physical and conceptual apparatus to capture, store, maintain and transmit information about the objects that captivate their interests. For instance, in their seminal work on actor-network theory (ANT), Latour and Callon propose that conceptions of reality result from interactions among people and non-human entities (Latour and Woolgar 1986; Callon 1984). Law (2008: 141), one of ANT's most vocal supporters, refers to ANT as

> a disparate family of material-semiotic tools, sensibilities and methods of analysis that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located. It assumes that nothing has reality or form outside the enactment of those relations. Its studies explore and characterize the webs and the

practices that carry them.

In other words, ANT posits that all things that comprise the world are co-created through their relations with other things. Non-human objects not only frame how human beings inhabit the world, but "push back" upon human actions with significant effects (Latour 1992). In the context of early studies of scientific research, ANT was used to understand the physical and communicative mechanisms – made up of non-human agents and information objects – upon which scientists rely to capture, document and ascribe meaning to particular facets of the world (cf. Latour and Woolgar 1986). ANT posits that scientists can only identify, characterize and understand objects of interest by co-creating their conceptions of reality alongside non-human agents.

In this work, Latour and Woolgar (1986: 245) state that science is primarily concerned with the creation of an ordered account of reality, rather than the transfer of information pertaining to the world into human-understandable formats. They characterize the latter of these two propositions as the practices enacted in order to fulfill the former aim. However, from a pragmatic perspective, these two processes may be intertwined and inseparable threads of a unified experience of knowledge production.

Offering another perspective, Knorr Cetina (1999) highlights how every action that someone takes in the production of knowledge is underpinned by a desire to fill a gap in knowledge or to square away any irregularities that disrupt ordered accounts of the world. Her work builds upon Latour and Woolgar's (1986) ethnography of laboratory settings with interviews of lab technicians concerning their thought processes while they worked. Specifically, Knorr Cetina (2001) emphasizes how scientists alter the material assemblage of the system on the basis of their understanding of what has or has not worked before, their suppositions concerning ways various actors might interact, and reiteration of their goals. Knorr Cetina therefore prioritizes human agency over the agency of non-human entities, which Latour and Woolgar, on the other hand, place on equal footing.

For Knorr Cetina, scientists' concerns with the phenomena that capture their interest derive from their consideration of how the knowledge they might obtain will fit into an established ordered account of the world. Her work reveals how ANT does not adequately account for the circumstances through which the structures that support science come into being, nor the intentionality of human agents who assem-

ble material apparatus to meet their goals (cf. Whittle et al. 2009). She refocuses attention on discursive aspects of knowledge production by considering expressions of potentiality, certainty and desire elicited by scientists as subjects acting with intent. This perspective, which emphasizes the perspectival and pragmatic aspects of scientific processes, is closely aligned with the social interactionist sociological framework, which originates from the pragmatist school of philosophy initiated by Charles Sanders Peirce, John Dewey, and George Herbert Mead. Social interactionism posits that people continuously re-create meanings through their shared understanding and interpretations of things (Nungesser 2021). It therefore traces the construction of symbolic worlds from everyday interactions.

In taking on this theoretical framework, I frame archaeology as a collective endeavour to derive a coherent understanding of the past, which involves the use of already established knowledge in the validation of newly formed ideas, and which relies on systems designed to carry information obtained with different chains of inference. These systems have both technical and social elements. The technical elements are the means through which information becomes encoded onto information objects so that they may form the basis for further inference. The social elements constitute a series of norms or expectations that facilitate the delegation of roles and responsibilities among agents who contribute their time, effort and accumulated knowledge to communal goals.

3.2 Realist and constructionist perspectives

In constructing the arguments of this dissertation and in carrying out the fieldwork that grounds it, I rely upon both realist and constructivist viewpoints. In one sense, I rely on documenting how people actually act, including the longer-term and collaborative implications that their actions may have on other work occurring throughout the continuum of practice. To accomplish this, I identify research activities from the perspective of an outside observer. I also ascribe meanings to things (such as physical or conceptual tools, or objects that captivate subjects' interests) in ways that conform to my own perspective as an investigator of scientific research practices. I am equipped with my own etic taxonomy of work processes and I rely on sensitizing concepts I have drawn from relevant work in Knowledge Management and Digital Curation (cf. Allen, Karanasios, and Slavova 2011; Benardou et al. 2010; Pertsas and Constantopoulos 2017).

This perspective is particularly well-suited for formulating a somewhat naïve view of information systems as systems that support series of distributed procedural engagements. This helps me accomplish my aim of disrupting the pervasive notion that archaeological work follows progressive and unidirectional trajectories akin to resource extraction workflows. I do this by highlighting how various people continuously curate information across networks of activities in various settings, at various times and tempos, while implementing various tools, methods and approaches (Dallas 2015). A realist perspective enables me to characterize different kinds or patterns of information flow topologically. For instance, it is possible to determine the conditions that need to be satisfied before performing certain tasks, or the extent to which certain procedures are either pre-formulated or improvised. It is necessary to ground the relationships between and among activities in observable reality in order to demonstrate adequately the validity of this novel approach (Dallas 2015: 193-198; 2016: 445-446; Huggett 2012).

On the other hand, a constructionist perspective enables me to consider how individual agents make components of information systems suit their needs to facilitate communication or interoperability among actors who hold different situated perspectives. By listening to participants' views about the systems with which they engage, including explanations as to why they act in the ways that they do, I am able to trace the assumptions and taken-for-granted behaviours that frame their perspectives (Fleck 2012; Knorr Cetina 1999). Moreover, these insights are useful for developing a better understanding of how participants identify with particular disciplinary communities and their perception of their roles within broader collective efforts.

Taken together, both realist and constructionist perspectives enable me to address the research questions that frame this dissertation.

3.3 A focus on activities

Activity theory is a methodological framework that complements my favoured perspective. Like ANT, activity theory examines the systematically organized series of relations that comprise activities. However, activities are understood as the relations between human subjects and the physical or conceptual tools or environments with or within which they act, and the motives or objectives that drive the system forward in a particular direction (Leont'ev 1974: 22-23).

Activity theory is useful to examine how people mobilize a series of physical and conceptual tools to overcome the conditions that separate actors' current states from their desired goals. In this sense, activity theory prioritizes the situated perspectives and experiences of human subjects while still trying to account for the agency that tools exhibit in their experiences as components of activity systems for addressing particular tasks.

More specifically, activity theory helps to draw generalized accounts of practices employed in research projects. Documenting taken-for-granted aspects of work in a structured manner provides a unique window into how such practices contribute to broader disciplinary norms or professional mindsets. Recorded conversations and observations of enacted practices may be compared to determine how goals and strategies for achieving them are drawn up with the actual implementation of tasks. This contributes to understanding how involved stakeholders perceive certain challenges, how they account for contingencies, and how indicators of success may change as work progresses. Using activity theory effectively is not about describing the minute processes of enacted work, but rather about investigating how tasks and operations are strategically implemented as part of a coordinated effort to achieve broader goals (Engeström 2000).

3.4 Activity interfaces

If I understand activities performed during the course of research to be acts of curation, whereby actors select, interpret, engage with, transform and ascribe new meaning to materials and information in accordance with their methodological approach (see Section 2.4), I may envision research projects as comprising webs of activities that rely on and produce physical and conceptual objects. I can then pick up and leverage objects derived from one activity as viable inputs for other activities, which may produce additional sets of outputs via their own investigative processes, thereby mediating among activities. These mediating objects may be accessible by multiple activities by virtue of their externality, portability and indexicality, and their value may vary when incorporated into different sets of activities, according to the warrants, constraints and expectations that each activity entails.

I use another methodological framework, distributed cognition, to highlight the interlocking convergence of a system's components, all of which contribute to the accomplishment of common goals. From a distributed cognition standpoint, the co-

herence of a system depends upon the shared goals and overall trajectory of all the system's components (Hutchins 1995). I apply it to frame the processes through which multiple outlooks on and interactions with the same things come together as complementary narratives. For instance, it is useful for examining how findings derived from work by various specialists are integrated and recontextualized in light of their common goals in order to form cogent archaeological narratives. Moreover, distributed cognition helps trace the network of relationships, dependencies or functional subsystems that must be maintained in order for the entire system to succeed in unison.

3.5 Accounting for discursive pressures

Activities are conducted with expectations that they will produce outputs that conform with the needs of others, which are derived and communicated through direct discussion among those conducting different activities, by referring to specifications that are enforced by a central authority, or by referring to a common understanding of how things should be done (e.g. "common sense"). The processes involved in ensuring that someone acts upon mediating objects in ways that either maintain or accrue value or meaning are acts of collaboration, communication and community-building.

Situated cognition is yet another methodological framework for examining the improvised, contingent and embodied experiences of human activity. It prioritizes subjects' outlooks, which are contextualized by their prior experiences. In this sense, situated cognition is closely related to Lave and Wenger's (1991) theory of situated learning (or 'communities of practice' approach). This approach examines how individuals acquire professional skills in relation to their social environments. It traces how people make sense of their environments and work with the physical and conceptual tools available to them to resolve immediate challenges (cf. Suchman 2007).

Situated cognition lends itself to investigating rather fluid, open-ended and affect-oriented actions, and is geared towards understanding how actors draw from their prior experiences to navigate unique situations. It may be applied to examine how people who are learning new skills learn how to work in new and possibly unfamiliar ways. In such situations, situated cognition enables observers to examine how people align their perspectives as work progresses, and to understand better how people's general outlooks may have changed under the guidance of more experienced mentors.

Situated cognition enables me to account for discursive aspects of work. It allows us to examine the perceived relationships, distinctions or intersections between practices that professional or research communities deem acceptable and unacceptable, and to account for the cultural or community-driven aspects of decisions that underlie particular actions.

3.6 Social worlds

I finally draw from social worlds/arenas theory for improved understanding of the various roles and perspectives that agents involved in the "universe of discourse" hold and from which social understanding emerges (Strauss 1978; Clarke and Star 2008). Social worlds/arenas theory focuses on commitment to collective action as a crucial element in understanding the development of social structures, with specific attention to the interfaces among agents who work in different capacities for mutual interests. For instance, it is common to use social worlds/arenas theory to identify various subworlds, or domains of work, that comprise "specialized concerns and interests within the larger community of common activities, which act to differentiate some members of the world from others" (Kling and Gerson 1978: 26). Agents take on certain roles within collective efforts, which come with their own sets of rights, privileges, norms, duties, responsibilities and expectations, and fulfill work activities accordingly. Social worlds are identified based on recognizable forms of actions and interactions, rather than on some essentializing character (Huysman and Elkjaer 2006: 7). This supports my emphasis on activities and activity interfaces described above.

Moreover, social worlds/arenas theory focuses on tensions and conflicts within organizations. Arenas serve as loci of discursive actions, whereby meanings and value regimes are negotiated, fought out, forced and manipulated (Strauss 1978: 124). In Chapter 5, I identify social worlds involved in archaeological research, and then in Chapter 6 I articulate various common archaeological activities as sites of discursive negotiation between representatives of those social worlds.

By identifying series of work roles, tools, modes of interaction, aspects of research environments and held values that are associated with a few domains of archaeological work, I am able to trace conflicting and complementary engagements among archaeologists working in different ways on the same objects of mutual interest.

3.7 Summary of applied approach

Ultimately, this dissertation is about the social order of scientific research, i.e. the frameworks, mindsets or sets of values that humans adopt to carry out their work in specific ways. Human beings rely upon physical and conceptual apparatus to do this work but, in order to understand how they do science *in ways that conform to the epistemic mandates of the scientific enterprise*, it is necessary to prioritize attention to human intention, drivers and pressures. I am emphasizing the agency of human drivers since they are the ones who (a) identify problems that need to be resolved; (b) imagine, project or predict potential outcomes of various kinds of actions that they may select to resolve the challenges; and (c) learn from prior experiences and change their behaviours accordingly.

In summary, a few focal concerns underpin this dissertation:

1. Concern with practical aspects of activities. Situated cognition and Knorr Cetina's (1999) pragmatic extension of ANT help me consider how actors can overcome gaps between the current status and completed objectives through effective action, how they select and use tools, and how environments condition, frame or influence their implementation of activities.

2. Concern with how to identify objectives as valuable outcomes. Activity theory and distributed cognition encourage me to consider how particular tasks into broader, segmented continua of practice, and how labour is distributed and synthesized among various individuals.

3. Concern with the taken-for-granted assumptions and dispositions that frame the work. Social worlds helps me to understand how professional norms and expectations are established, intuitions concerning what kinds of outputs might derive from particular kinds of activities, how professional styles, genres or props mediate identity within a research community, and the formation of value regimes based around situated work experiences.

In other words, my approach renders knowledge production as a dynamic, constructive and situated process that involves the use of already established knowledge in the validation of newly formed ideas. By highlighting how pragmatic actions are conducted in relation to broader discursive frameworks, scholarly practices are considered in terms of potential, certainty and desire from the perspectives of practitioners themselves. This is made possible by considering data as discursive media

that connects distributed actions experienced by people operating in disparate work environments, as discussed in Section 2.4.

Chapter 4

Methods

This dissertation addresses many interrelated issues concerning the socio-technical systems through which archaeologists operate. The relationships between these foci have not always been clear, and, especially as I was starting my research, I have drawn from personal experience and intuition to formulate research strategies that would enable me to investigate these interests rigorously and thoroughly. I eventually developed a more cohesive vision of archaeological data work as discursive practice (see Section 2.4) and reviewed a range of frameworks through which I could explore my interests (see Chapter 3). After articulating these interests and framing devices, I then began to consider (a) the kinds of questions that I seek to address, (b) the potential viability of outcomes or outputs that a particular method or approach might afford, and (c) pragmatic concerns about implementing the collection, management, analysis and sharing of data and findings. This chapter contextualizes the methods and evidence that I exploit by accounting for their epistemic affordances and limitations, and describes how I applied these methods in my research.

4.1 Qualitative research design

This thesis follows an abductive qualitative data analysis methodology to construct theories founded upon empirical evidence, which relates to, but is distinct from, grounded theory. Grounded theory consists of a series of systematic yet flexible guidelines for deriving theory from data through continuous and reiterative engagement with evidence (Charmaz 2014: 1). My approach draws from what Charmaz (2014: 14-15) calls the "constellation of methods" associated with grounded theory that are

helpful for making sense of qualitative data. However, it differs from grounded theory as it is traditionally conceived in that I came to the project with well defined theoretical goals (as described in Chapter 2 and Chapter 3) and did not make a concerted effort to allow the theory to emerge through the analytical process. Proponents of a more open-ended or improvised approach, as grounded theory was originally applied, argue that researchers should be free to generate theories in accordance with their own creative insights and their intimate engagements with the evidence. We can evaluate the quality of such work in terms of the dialogical commitments between researchers and their subjects, and between researchers and those who read their work (Glaser and Strauss 1967: 230-233). Others view grounded theory more as a means of clarifying and articulating phenomena that lie below the surface of observable social experiences (Strauss and Corbin 1990; Kelle 2005). Proponents of this approach are very concerned with ensuring that concepts, themes and theories are truly represented in and limited by the data, and therefore prioritize adherence to systematic validation criteria to ensure the soundness of their claims.

Another view, known as constructivist grounded theory, most resembles my own approach. It recognizes that it is impossible to initiate a project without already holding ideas regarding the phenomena of interest, and that the ways that one ascribes meanings to the data represent already established mindsets or conceptual frameworks (Charmaz 2014). It encourages reflection on the researcher's standpoint as they pursue an abductive approach rooted in their own preconceptions (Mills, Bonner, and Francis 2006).

All of these approaches rely on a core set of methods of coding and memoing. Coding, which involves defining what data are about in terms that are relevant to the theoretical frameworks that inform my research, entails rendering instances within a text as interpreted abstractions called codes (Charmaz 2014: 43). Codes can exist at various levels of abstraction. For instance, we can apply descriptive codes to characterize literal facets of an instance within a text, whereas theoretical codes might represent more interpretive concepts that correspond with aspects of particular theoretical frameworks. Codes are often created on the fly as "open codes" when prompted by encounters with demonstrative instances in the text. Open coding involves synthesis of concepts that speak to the researcher's understanding of the phenomena of interest, while remaining receptive to limits imposed by what is actually contained in the text. Codes may then be arranged and queried to formulate themes and theories. Grounded theory enables theories to be distilled from data through the

attribution of codes that stand in for the researcher's conceptions of what is going on in the recorded data.

Memoing entails more open-ended exploration and reflection upon latent ideas in order to crystalize them into new avenues to pursue (Charmaz 2014: 72). Constructing memos is a relatively flexible way of engaging with data and serves as fertile ground for honing new ideas. Memoing is especially crucial while articulating sensitizing concepts, or the "points of departure from which to study the data" (Charmaz 2003: 259) that inform the development of my code structure. Memoing allows a researcher to take initial notions that lack specification of well-defined attributes, and gradually refine them into more cohesive, definitive concepts (Blumer 1954: 7; Bowen 2006). Exploring the main features, relationships or arrangements that underlie a superficial view of a sensitizing concept through memoing helps us identify what kinds of things we need to locate in the data in order to gain a full understanding of the phenomena of interest.

Memoing is also very important in the process of drawing out more coherent meaning from coded data (cf. Charmaz 2014: 181, 290-293). By creating memos pertaining to the intersections of various codes and drawing comparisons across similarly coded instances, I was able to form more robust and generalizable arguments about the phenomena of interest and relate them to alternative perspectives expressed by others.

These methods are particularly useful for examining the broad assemblage of evidence comprising various kinds of media and spanning multiple case studies. The abstraction of specific instances as conceptual codes enables comparisons across documents that would otherwise prove difficult to compare, due either to my own preconceptions (drawn from internalized narratives or biases) that might have framed my attitudes, to disproportionate volumes of evidence that might obscure parallels between case studies, or to difficulties experienced when examining different kinds of documents that call for different lenses or perspectives.

4.2 Case studies

This dissertation draws from data collected at three archaeological projects, which represent distinct yet complementary cases. In case-study research, cases represent discrete instances of a phenomenon that inform the researcher about it, and their

selection is based on their relevance to a central topic and their ability to contribute novel insights about it (Ragin 1992). Cases usually share common reference to the overall research themes, but exhibit variations that enable a researcher to capture different outlooks or perspectives on the matter of communal interest. Drawing from multiple cases thus enables comprehensive coverage of a broad topic that no single case may cover on its own.

However, in this thesis, the cases are not the subjects of inquiry. Instead, they represent unique sets of circumstances that frame or contextualize sets of activities. For instance, the cases on which I rely are archaeological projects that have their own histories, memberships, sets of tools, methods, and social or political circumstances. These frame the archaeological activities that are actually my primary objects of inquiry. In this thesis, the cases are contexts that ascribe particular local flavours to the activities I trace, and which I must consider to account fully for the range of motivations, circumstances and affordances that back decisions to perform activities and to implement them in specific ways. This follows the approach advocated that Nicolini (2009) and Maryl et al. (2020: para. 30) advocate. They suggest "zooming in to a granular study of particular research activities and operations and zooming out to considering broader socio-technical and cultural factors". This involves "magnifying or blowing up the details of practice, switching theoretical lenses, and selective re-positioning so that certain aspects are fore-grounded and others are temporarily sent to the background" (Nicolini 2009: 1412). This approach is useful for me because archaeological projects all start from different positions but share common practices and tendencies that vary according to those contextual circumstances. Thus I can tactfully switch between those lenses to understand the interplay between circumstances and practical implementations.

While I recognize that decisions, actions and attitudes may vary according to different traditions of practice, my goal is not to survey the whole archaeological discipline. Rather, I aim to make certain underappreciated social and collaborative commitments that underlie common tools and practices more visible, and to draw greater attention to certain sensibilities, attitudes and apprehensions that are relevant to contemporary discourse on the nature of archaeological data and ongoing development of information infrastructures. I am therefore not as concerned with generalizing my findings across the whole field as much as I am with articulating some significant factors that contribute to decisions and behaviours that archaeologists commonly make and enact. My selection of cases reflects a need to account for

a wide range of practices that are relevant to my goal of investigating the tools and practices that mediate archaeological communication and collaboration.

4.2.1 Selection of cases

A few factors contributed to decisions regarding the selection of cases. A primary concern was each case's ability to contribute to this dissertation's topic of interest.

Each case provided me with opportunities to explore distinct and overlapping aspects of archaeological practice. Some cases provide better or more extensive evidence than others for certain aspects of my research. Table 4.1 briefly characterizes my engagement with each case and the kinds of data I obtained from them, and Table 4.2 provides an overview of how each case contributed to my study.

My work at Case A, which involved more in-depth and long-term participation over the course of three full fieldwork seasons, constitutes a longitudinal case study that captures a drawn-out account of a dynamic information landscape. In comparison, my work at Case B involved observing a single week of fieldwork, and my work at Case C involved performing a series of interviews over the span of four months, including a week-long visit to the premises where their data are stored, integrated and processed. I was therefore more familiar with the people, processes and background at Case A relative to Case B and Case C. Case B and Case C therefore comprise more focused, topical assessments regarding the development and use of relatively stable systems.

	Kind	**Span**	**Data**
Case A	Archaeological project	Three years	Observation, interviews, document analysis
Case B	Archaeological project	One week	Observation, interviews
Case C	Data-sharing consortium	Six months	Interviews

Table 4.1: Overview of my engagement with each case and the kinds of data I obtained from them.

	Focus
Case A	Activities distributed over time, place, and circumstance The social and technical apparatus that draw experiences together
Case B	How digital systems direct data and labour toward certain outcomes Apprehensions and affordances of and about these systems
Case C	Reconciliation of formal and informal relationships Administrative and technical apparatus of data integration

Table 4.2: Overview of how each case contributed to my study.

While I have been "zooming-in and zooming-out" in all three case studies to gain well-rounded insight regarding each one (cf. Nicolini 2009), Case A and Case B involve observational work and therefore allow me to highlight more interactional, micro-level aspects of archaeological processes. Case C, on the other hand, is entirely based on interviews and is therefore more suited to examining the contextual, systematic, macro-level dimensions regarding how broader factors affect archaeological work.

Moreover, my work at Case A was more drawn-out and afforded me with greater awareness of its organizational and institutional history, including a deeper familiarity with all the people involved. In Case A, my understanding of the context behind the things we discussed in our interviews made it easier to communicate nuanced tendencies without needing to explain background information. Participants from Case A were also more comfortable sharing their thoughts on how the project operates on a systemic level since I had developed a more trusting rapport than I had with participants from Case B and Case C. Discussions about social and professional relationships are therefore more detailed, situated and personal in evidence derived from Case A than from Case B and Case C. This is reflected in my citation practices, for instance in my imbalanced reliance on Case A in Section 5.1 regarding archaeological project management.

I also took care to avoid using direct quotations referenced in other published work that relies on one overlapping case. That other study is governed by a more permissive ethics protocol that allows it to share participants' personally identifying information with their consent. I had to exclude many potentially insightful pieces of evidence that were already published elsewhere to keep from revealing my participants' identities, thereby reducing risk toward harming their personal and professional reputations.

My familiarity with background knowledge pertaining to the distinct regional, temporal and topical foci of each project, based on my prior work as an archaeologist, was also important in selecting cases. This familiarity enabled me to recognize which casual references to commonly held notions or to work done by others in the research community warranted further explanation. This helped save time during interviews to focus on what I needed to cover, and contributed to the degree of patience that participants exhibited when explaining their work to me as they worked.

It was also fundamentally necessary that I be able to access the people and places that I hoped to include in my work. Fieldwork pertaining to all cases involved travelling to meet with people and to observe work in the settings where they typically

performed their work. Planning fieldwork involved carefully managing time, expenses, and my responsibilities to others.

4.2.2 Limitations

Although this dissertation is a fairly comprehensive investigation of various interconnected archaeological practices, I was unable to account for several meaningful topics and perspectives. This was partly due to the fact that I was only able to observe activities that occurred while I was actively engaged with each project, and that I was only able to record things that participants deemed meaningful enough to elicit during our interviews. Here I will outline some potentially meaningful aspects that I was unable to capture, refer to alternative research that focuses on these missing pieces, and consider how these gaps might be more effectively explored in the future.

Grantsmanship and review processes are one interesting aspect of project management, but which I was not able to directly observe due to the timing of my involvement with each case. More specifically, I joined each project after all funding and permits had been obtained and while work was already underway. I relied on participants' elicitations of their experiences to ascertain how grant and permit application processes are conducted and to determine how they factor into the formation of archaeological projects. A more focused study on this aspect of archaeological project management might be more appropriately timed to begin before projects have even applied for funding, account for the apprehensions experienced by applicants, and even document rejections and the ways applicants learn from failure.

I was also unable to directly observe data analysis and writing processes. This was due to the timing of my participation, and the asynchronous nature of this kind of work, which I was unprepared to document given the methods and tools at my disposal. Moreover, this tends to be a very private affair, and I would have needed to foster a stronger degree of trust to gain access to the inner workings of data analysis and synthesis.

While I was collecting data, I did not emphasize analysis of the production and use of internal documents such as trench reports, but in hindsight this would have been a very relevant series of activities to follow. However, Huvila, Sköld, and Börjesson (2021) and Huvila, Börjesson, and Sköld (2022) have conducted similar work along these lines by examining the production and use of archaeological project reports, with an emphasis on enhancing their potential for reuse.

I did not pay close attention to the perspectives of lab workers, consultants, or institutional stakeholders who tend to act in service of core project teams, which were my main emphasis. See Buchanan (2019) for a similar focus on the extended continuum of archaeological practice in the context of museum work, specifically.

Commercial archaeology is conspicuously absent from this dissertation's scope, despite the fact that this accounts for the vast majority of archaeological work conducted throughout North America and Europe. My own lack of experience with and knowledge about commercial archaeology contributed to my decision to exclude it from this dissertation. However, see Zorzin (2015) and Thorpe (2012) for similar work pertaining to commercial archaeology.

Finally, community-led or Indigenous-led initiatives are absent in my cases. However, see S. Perry (2018) and Gupta et al. (2023) for work that grapples with similar tensions in these contexts.

4.2.3 Description of cases

I examined the work of three archaeological projects. All participants' identities are confidential to enable them to speak openly about their views while minimizing risk to their professional reputations. Consequently, all names presented in this dissertation are pseudonyms. To further reduce risk of harm, I also assigned pseudonyms to other information that might reveal participants' personal identities, such as the names and locations of the projects or their participants, and the names of other people, places or projects that the participants mentioned.

Case A

The first case followed archaeologists' evolving engagement with the information system developed for Case A, which largely comprises the excavation of a prehistoric site in southern Europe.

Like many other archaeological projects, Case A's research team composition and governance structure follows a common model, with a director who coordinates the project, various specialists whom the director recruited for their expertise in the interpretation of finds, a number of trench supervisors who lead excavation and coordinate data collection, and excavators who are usually less experienced students who operate under the guidance of their assigned trench supervisors. It also relies extensively

on archaeological surface surveys and assessments of the landscape to inform excavation strategies and guide interpretations of finds. Digital tools and methods are increasingly important in these projects, as informed by examples of their similar use elsewhere in a way that encourages their subsequent adoption by others. Like any other archaeological project, Case A addresses common underlying research questions, and its participants compare its findings with similar work in the vicinity. Moreover, it relies on and engages with local communities who support the research by agreeing to excavation on their lands, while also providing housing, food and other support to the mostly foreign research team. This project serves as a useful case study that illustrates of the pragmatic and multifaceted ways in which participants reason and work their way through the rather mundane activities that archaeologists commonly undertake in similar research contexts.

I have actively contributed to Case A for several years, largely performing data management and maintenance work. This has provided me with a privileged outlook on how team members structure information, how they typically use data, and what circumstantial events or motivating factors frame such concerns.

I have documented how participants engage with this project's information system over the course of three years, from 2017 to 2019. This involved visiting the project during its summer field seasons to observe archaeological practices and to interview selected participants. I also held interviews throughout the 'off season', both remotely and in person. The project's director has also made all of the project's documentation and records available to me for the purpose of this research.

The data I collected largely pertains to fieldwork recording practices, processing and analysis of finds, records management, interdisciplinary collaboration, decisions regarding writing and publication of findings, and discussions of how data and findings are presented, evaluated and revised among broader research communities.

Here is a list and brief description of project members and affiliates mentioned throughout this dissertation:

Basil Project director and faculty member at a North American university. He has extensive field experience and has consulted as a lithics specialist for various other projects, where he met many of the people who became involved with Case A.

Gabe Geoarchaeologist attached to the project. He initially served as field director,

but his presence on this project became sparse after he took on additional work with other research projects elsewhere. He remained on board as a significant collaborator, but no longer as field director. He is known for his aptitude with statistical analysis and for being level-headed.

Alfred Senior graduate student working at the project for his geoarchaeology dissertation at a North American university. He took on the role of field director while Gabe peeled back his commitments. He is confident, with a hands-on, get-things-done attitude.

Theo Commercial archaeologist, recommended to Basil by a mutual friend. An excavator by profession, his competence often serves as an example for the rest of the crew. He became field director after Alfred finished his dissertation and moved on. He is very laid back and has a casual attitude.

Jolene Senior graduate student who oversees the analysis of chipped stone for the project. She met Basil while working at another project.

Agatha Graduate student who serves as Jolene's assistant. Her specialty is groundstone artefacts but in this project she largely performs logistical duties.

Dorothy Senior graduate student who oversees palaeobotanical analysis, including sample collection and processing protocols.

Ana Lithics analyst who specializes in differentiating and identifying varieties of raw materials through physical and geochemical means.

Marie Optically stimulated luminescence (OSL) dating specialist who collects and processes samples in her laboratory at her home institution.

Maude Graduate student who serves as Marie's assistant. She comes to collect OSL samples when Marie is not available, and is involved in processing and analyzing them at the lab.

Andreas Geoarchaeological specialist affiliated with the project who has provided significantly impactful consultations and guidance on how to proceed with certain excavation and sample-collection procedures.

Talia Junior faculty member who became involved with the project as a trench supervisor after a colleague recommended her to Basil.

Alice Graduate student who became involved with the project as a trench supervisor after a colleague recommended her to Basil.

Lauren Graduate student who became involved with the project as a trench supervisor after a colleague recommended her to Basil.

Lester Commercial archaeologist who became involved with the project as a trench supervisor after Theo recommended him to Basil.

Olivia Commercial archaeologist who became involved with the project as a trench supervisor after Alfred recommended her to Basil.

Eve One of Basil's stand-out students who has been involved in the project since its inception, primarily as a fieldworker.

Jane One of Basil's top students, who joined the project for one season. As a very independent and competent worker, she took on supervisory responsibilities and stood out as an exemplary fieldworker.

Ben One of Basil's top students, who joined as a trench assistant. He came back the following year as a trench supervisor.

Michelle Undergraduate student who joined as a trench assistant, but found a more persistent role working in the dig house and museum, where she handled logistical processes alongside Agatha.

Isabelle Undergraduate student who joined as a trench assistant. She works as Basil's lab assistant during the off-season as well.

Jamie Undergraduate student who assisted with database management work.

Various students recruited from Basil's classes were also present or mentioned throughout my work at Case A. They generally have very little or no field experience, and most were involved for only one season as excavators.

Various colleagues, projects and institutional partners were also commonly mentioned in interviews and day-to-day interactions.

Case B

The second case centres on the fieldwork at Case B, which comprises an excavation at a site located in the eastern Mediterranean region. This project is generally regarded

as being technologically innovative for the ways that it has integrated novel digital tools and technologies into daily fieldwork routines. More specifically, Case B makes use of photogrammetry and advanced spatial recording systems in ways that provide practical value, rather than as superfluous or experimental use cases, which is how most other implementations of these tools and technologies have been commonly characterized.

Case B is also firmly committed to publishing its data openly, having done so for several years. It is sometimes showcased as an example of how to implement 'open' principles in archaeology more generally.

While Case B has an organizational structure similar to that of Case A, it is worth noting that it is the second iteration of a project that began during the mid-1990s. One of the two current co-directors is a former mentee of the former co-directors.

I visited this project for ten days during its 2019 summer fieldwork season. My visit largely focused on how participants interact with information systems, how the tools that they use pose challenges, and how participants find solutions to those problems.

Here is a list and brief description of project members and affiliates mentioned throughout this dissertation:

Rufus Project co-director. As a former student of one of the previous co-directors and a leading participant in prior research at the site, Rufus was well suited to take the reigns when the former directors transitioned to other research interests. Rufus is an expert in the archaeology of the region, and an innovator in the application of digital recording practices in archaeological fieldwork.

Chris Project co-director. He is a specialist in the archaeology of the region and a very experienced fieldworker. He uses the project as a base for a field school, where undergraduate students from his university learn basic fieldwork practices.

Bernard Former co-director who has moved on to working at other projects elsewhere in the region. He still consults with the team currently working at Case B.

Hugh Former co-director who started working on other projects. However, he also plays an active role as a ceramics analysis specialist at Case B.

Liz Graduate student and trench supervisor who worked with the project the previous year. Her dissertation is in part based on data derived from this project.

Vanessa Graduate student and trench supervisor who is new to the project, but who has gained excavation experience elsewhere.

Logan Rufus's colleague and friend. They work together back at their home institution. Logan is planning to lead a field school based at his own institution, in addition to the one led by Chris.

Greg Rufus's old friend who serves as the project's database technician. He works as a database operator at a large commercial firm and is offering his expertise to rebuild the project's database to more technically and professionally sound standards.

Several undergraduate students from Chris' university participated in his field school and served as trench assistants. Among the six students, only **Oliver** features prominently in my data.

Various colleagues, projects and institutional partners were also commonly mentioned in interviews and day-to-day interactions.

Case C

The third case focuses on a large, collaborative consortium whose mission is to integrate data that numerous ongoing and completed projects have collected to conduct synthetic research using digital tools. As an administrative and technical apparatus, it seeks to balance the autonomy of partnering projects with communal and tangential goals. It relies on a data curation service as a crucial partner; its role is to facilitate the integration of data that participating projects provide. My research investigates how stakeholders determine the limits of their roles and perceive the value of their contributions, and how they implement plans to achieve imagined outcomes or goals.

This case primarily involved conducting retrospective interviews. I talked with people who lead collaborative operations at Case C, as well as people who operate the digital infrastructures that support collaborative data sharing. The content of interviews largely pertained to how participants initiated and maintained collaborative ties across projects and the administrative, social, technical and professional challenges of drawing archaeologists together.

Here is a list and brief description of project members and affiliates mentioned throughout this dissertation:

George Project director. Leads in all administrative aspects, and is in charge of ensuring that work continues apace by introducing new research opportunities, establishing institutional partnerships, and securing and distributing funding.

Leonard Directs the data service that facilitates data integration at Case C. He is a very technically-minded person with lots of experience developing data management software. George and Leonard are old friends and have worked together in the past, particularly in testing out novel digital systems for managing archaeological data from their projects.

Amelie Technical director responsible for developing and maintaining the digital systems that support the data service. Trained as a computer scientist and married to Leonard, she has worked among archaeologists to support archaeological data management for many years.

Paul Amelie's assistant for Leonard's former student, responsible for providing support for clients who use the service and for supporting Amelie's work. Paul comes from a mixed archaeology and computer science background, with experience doing data management work in commercial settings.

Barry Case C's general manager and "point man" for many of its operations. He is an experienced fieldworker who is very technically-minded through casual hacking experience, and is responsible for establishing concrete plans for assembling, integrating and making use of data. He also directly supervises and performs these tasks. That he is very sociable and amicable contributes to his ability to foster connections and garner new collaborative opportunities.

Howard Supervises student workers who enter and enrich data in digital formats.

Ned Junior member of the team that manages the data service, who has served as technical support liaison with archaeological projects that rely on the service to manage their data. An experienced fieldworker, database manager, and IT worker, he is responsible for setting up the database in fieldwork settings and training or otherwise facilitating its use by the project's personnel.

John A PhD student and trench supervisor at a project affiliated with Case C, but not a core member of the consortium's administrative team. He regularly

uses the digital infrastructure designed to support data integration, particularly to add photographic data and metadata and to update individual records as needed.

Various colleagues, projects and institutional partners were also commonly mentioned in interviews and day-to-day interactions.

4.3 Data and evidence

I followed a rather open-ended data-collection strategy that involved capturing as much observational data and performing as many interviews as possible, with a general focus on the production of archaeological records and collaborative work practices. Table 4.3 presents a breakdown of the amount of data that each case generated.

	Retrospective interviews	**Hours of work observed**	**Hours of observational media recorded**	**Total hours of recorded media**
Case A	13	66	122.5	136
Case B	6	24	31	37.5
Case C	12	0	0	19.5
Total	31	90	153.5	193

Table 4.3: Breakdown of data collected across cases. Some interviews included more than one participant, and some participants sat for more than one interview. Embedded interviews are not counted because they occurred while observing work and are difficult to distinguish from the remainder of the interaction. Total hours of recorded footage include redundant coverage of co-occurring phenomena recorded by multiple cameras. It does not include passive or background observations made while living at or working on these projects.

As described in Section 4.4 below, I qualitatively coded these records so that specific entities, processes, aspects and attitudes would be comparable across the dataset. In unifying the data according to my own coding scheme, I was able to render the data comparable and amenable to be addressing my research interests.

4.3.1 Kinds of data

I collected various kinds of data using mixed methods. The different cases warranted different means of data collection, depending on the kinds of work that I set out to document and how much access I was granted to investigate each project.

Observation

Observational data comprises records of participants' behaviours as they performed various archaeological activities. They take the form of video, audio and textual records.

Some of the primary foci of my observations were the processes that result in archaeological records; people's use of information objects or interfaces, which sometimes differ from expected behaviour established through their design; how subjects implemented unconventional solutions or "hacks" to work around problems; how the context of an activity affects its implementation; and how local or idiosyncratic terms, concepts and gestures become established in a research community.

Observational data allow me to document what participants actually do as opposed to what they think or say they do. They enable me to document *how* practices are performed, in addition to the fact *that* they are performed. For instance, participants sometimes recall order of operations out of sequence, or do not identify all the tools and processes that I recognize as relevant. Through observation, I can situate activities in relation to broader systems even when participants are unaware that they are contributing to these systems. Moreover, as persistent digital media, these records enable me to replay observed activities so that I can draw new meaning from them after subsequent viewings. I can also replay records out of chronological sequence, which helps me consider how activities occurring at various times or in various contexts indirectly relate to, compare with or inform each other.

Embedded interviews

Embedded interviews comprise conversational inquiries with participants in the context of their work. These data are meant to account for participants' perspectives regarding how and why they act as they do, given the immediate constraints of the situation at hand. Unlike observational records, embedded interviews provide insight into the practicalities of work in the moment, from the perspective of practitioners themselves (Flick 1997, 2000; Witzel 2000). However, they are also useful for comparing participants' responses with observational records to interrogate how and why participants' observed actions may differ from the rationales elucidated from embedded interviews.

Some of the primary foci of my embedded interviews are to account for how participants identify problems or challenges in their work, and to determine ways to

resolve them; how certain people gain recognition as domain experts or authorities with specialized knowledge; how specialists relate their contributions to the contributions of others; and how specialists relate their situated perspectives to centralized knowledge repositories.

Retrospective interviews

Retrospective interviews comprise longer interviews outside of work settings with select participants to contextualize data collected by other means and to determine participants' views on more general or relatively unobservable aspects of archaeological research (such as planning, publishing, collaboration, etc). Retrospective interviews also helped me gain insight into how participants situate themselves as members of and in relation to research communities, which may be characterized by different regimes of value and by different methodological protocols or argumentation strategies.

Some of the primary foci of my retrospective interviews are to highlight participants' perspectives on the value of various kinds of research outputs, what they value in their work and the work of others, the major constraints and challenges that they and their communities face, and how they might resolve them.

Examining documents and media

I examined documents and media (such as forms, photographs, labels, databases, datasets and reports) to gain insight into institutional norms or expectations. My analysis emphasized how people interacted with these objects, so that I could assess how they valued them and the conditions under which they deemed them useful or meaningful. I also examined documents and media as means for encapsulating and communicating meanings among users across space and over time. This helped me to understand the vectors through which participants either tacitly form collective experiences or directly collaborate among themselves (Huvila 2011, 2016; Yarrow 2008).

Some of my primary foci are understanding how document design and media capture protocols anticipate certain methods; how various activities refer to recorded information, especially archived information; the reasons why team members ignore certain equipment and forms of documentation despite their availability; how record-keeping is controlled through explicit or implicit imposition of limitations or con-

straints; why certain records play more a more central role than others; and how different archaeologists record the same objects in different ways.

Field notes

My field notes comprise reflexive journal entries that I wrote between observational sessions or interviews. They also include moments from observational sessions or interviews that I deemed particularly important. Some entries also include descriptive accounts of unrecorded activities or conversations that I have since deemed useful data in their own right.

4.3.2 Data collection and media processing

I recorded video using three GoPro Hero 4 Silver action cameras, which are specifically designed for portable use in outdoor or rugged environments, including archaeological fieldwork settings. Up to three cameras may have been running simultaneously to capture scenes from various perspectives. Head mounts were also used in some situations in order to obtain footage that closely resembled the first-person perspectives of participants. Video quality was reduced to 720p resolution at a rate of 30 frames per second in order to optimize battery life and maximize the footage that could be stored on each camera's memory card.

GoPro action cameras are not optimized for high-quality audio, so I used a SONY ICD-UX560 audio recorder to capture supplementary audio in the lossless 16 bit 44.1 kHz Linear PCM wav format. I sometimes applied audio filters to enhance audio playback while transcribing selected sections of observational and embedded interview records.

Handwritten notes in bound notebooks largely comprised descriptive documentation of activities and interactions when cameras were not operating, preliminary interpretations of observed behaviours, and notes on things I planned to follow up on at a later time.

Photos, screenshots and still shots extracted from video served to capture documents and media that participants created and used. In some cases, participants provided me with PDFs, photos and other digital files as exact copies or facsimiles of such documents or media.

Data collected in various media formats were processed to optimize their util-

ity. Raw video and audio files were concatenated, synchronized, labelled, enhanced and organized to enhance retrieval and playback. Refer to Appendix A for detailed documentation of the specific editing processes and procedures.

Retrospective interviews were manually transcribed and edited. In some cases, I leveraged automated speech recognition and natural language processing to create preliminary transcripts, which I then manually edited. Handwritten notes were manually transcribed and observational records and embedded interviews were transcribed as-needed.

Handwritten notes were scanned as PDFs. All photos, PDFs and other media were also assembled and organized alongside all other data.

All data was processed and stored on an encrypted portable hard drive, and regularly backed-up onto two other identical drives. When setting up a MaxQDA project file, media files were linked rather than directly imported to ensure that the data, which contains confidential information, would remain encrypted.

4.3.3 Presenting the data

The analysis presented in Chapters 5, 6 and 7 refers to data presented in Appendix C, which presents transcribed textual excerpts and hyperlinks to a repository that contains relevant visual media clips. These references, which are grouped according to the case that they pertain to, resemble sequential endnotes and appear in superscript throughout the text.

Excerpt 4.1. Example of a data citation.

> Ellie and Bob are my favourite cats.[A1, B2, C3]

The letter prefixes correspond with the cases described in Section 4.2.3. In some cases, I also refer to unrecorded conversations or interactions, as well as observations that can not be transcribed in text-based formats.

I created some embedded figures by annotating scanned documents, screenshots, or still images derived from video records.

4.3.4 Research ethics protocol

I obtained informed consent from all individuals included in this study in compliance with the University of Toronto's Social Sciences, Humanities, and Education Research Ethics Board, Protocol 34526.

In order to ensure that participants could speak freely about their personal and professional relationships while minimizing risk to their personal and professional reputations, I committed to refrain from publishing any personally identifying information. I refer to all participants, affiliated organizations, and mentioned individuals or organizations using pseudonyms. I also edited visual media to obscure participants' faces and other information that might reveal their identities.

As I mentioned in Section 4.2.1 above, I also took care to edit or avoid using direct quotations that were cited in other published work that follows a more permissive protocol regarding the dissemination of participants' identifying information.

4.4 Qualitative data analysis

My analysis involved an abductive qualitative data analysis methodology to articulate theories based on empirical evidence. This entailed coding segments of video, audio and text with precise language that serves to bridge the gap between the archaeological practices I observed and the theoretical frameworks I applied to explore them as epistemic activities and interfaces. Extensive memoing and critical writing exercises were also crucial for directing the work toward meaningful ends.

4.4.1 Coding and memoing

As I collected and processed the data, I produced memos and analytical notes that captured preliminary questions, ideas and insights, as well as sensitizing concepts or associations with relevant scholarly literature (Bowen 2006). This helped me refamiliarize and reframe what I had experienced in my fieldwork in relation to my research questions (Saldaña 2011: 95). This also involved identifying key moments of recorded observations or conversations, out of the hundreds of hours of recorded data I had collected, that represent phenomena of particular interest.

I concurrently developed descriptive and theoretical code systems with these memos in mind. Rather than create a series of pre-defined codes, I created a se-

ries of open-ended "stubs" or code headers that codes could be slotted under. Coding involved creating codes and arranging them within the code system on the fly. This enabled my coding to be succinct and extensible while also preserving the system's conceptual clarity. My approach therefore starts off from a solid base conception of the field I sought to investigate (derived from memos, sensitizing concepts, and my own preconceptions), and draws what my subjects say and do into this conceptual framework. As I mentioned in Section 4.1, this abductive approach closely resembles Charmaz (2014) pragmatic application of grounded theory methods.

The descriptive code system is meant to identify relevant entities or concepts that appear throughout the dataset. The theoretical code system mediates between grounded observations and the theoretical frameworks I apply to explain them. I drew from the code systems of the E-CURATORS project, whose topical and thematic interests overlap with my own (Maryl et al. 2020; Batist et al. 2021). See Appendix B for an overview of the code system.

Coding makes it possible to track various engagements with data across many instantiations, thus enabling greater visibility of trends and patterns than would otherwise be identifiable in such a systematic manner (Saldaña 2011: 95-98). I compared various instances of related phenomena that occur across my case studies to derive explanations and interpretive insights based on applicable theoretical frameworks.

Coding in general is a gradual process involving the application of various conceptual layers over time, as text or footage is continuously and repeatedly reviewed. While I developed the general structure of the code system prior to initiating coding, it evolved as coding progressed. For instance, I tended to apply the descriptive scheme during the first pass of coding, which provided opportunities to engage with the texts and reflect upon how I would approach the design of the theoretical coding system.

I performed all of this work was performed with MaxQDA, a proprietary qualitative data analysis software suite that stores all of these connections within a centralized database (VERBI Software 2021). This allows me to retrieve segments of text from across various documents that have been assigned the same sets of codes, and perform more complex queries that search along different parameters of overlap, intersection, and exclusion. I was then able to query the integrated dataset to produce elaborated accounts of specific kinds of activities, media, and sentiments.

4.4.2 Analysis and writing

As I progressed through the coding process and devised a series of sensitizing concepts, I began outlining the analysis chapters. This dissertation's chapters are therefore informed both by the kinds of things I observed in the data and my ideas concerning what problems my thesis could speak to. The outline, which was in constant flux earlier on, was informed by my memos and sensitizing concepts (Saldaña 2011: 98-99, 102-103). I annotated each topic or subheading with corresponding key terms and with reference to specific examples or anecdotes that stood out in my memory. I also created a skeleton, or a logical outline that documents chains of assertions and the evidence that support them.[4]

After I determined the initial scope for each topic, I then more comprehensively queried the MaxQDA database to balance my initial impressions with the available evidence (Nicolini 2009). I searched for instances coded using terms that relate to the key terms I drew up for each topic, and I laid coded segments out in a document for each topic. I then derived firm statements that these coded segments would support, and assembled these statements into more comprehensive and thematically-organized arguments that correspond with the topics delineated in my outline and skeleton. The findings presented in the following three chapters therefore derive from combined and fluid analysis and writing processes.

4. Brian Cantwell Smith, who created this exercise and who advised me while I developed my own skeleton, describes a skeleton as a short summary of the claims and arguments to be made in a paper, with the aim of distilling the substance of one's thoughts, in order to focus on, and subject to critical scrutiny, the essential core of the argument. Skeletons present arguments in logical rather than rhetorical order, avoid introductions, and just focus on the "guts" of what is to be claimed.

Chapter 5

Social Worlds

The previous chapters outlined this dissertations' scope and context, and the theoretical and methodological approaches I apply to achieve my objectives stated in Chapter 1. Now, I will shift to present my original research, based on an analysis of evidence from three academic archaeological projects in the Eastern Mediterranean. My analysis is structured around three main areas of concern: the social worlds of archaeological knowledge production which I describe in this chapter, the discursive relations among archaeological activities (Chapter 6), and finally, sociotechnical tensions that emerge from these relationships (Chapter 7). These three chapters connect in such ways to support my general argument that archaeological research, as manifested in my three case studies, is structured by a series of collaborative commitments.

In order to consider the discursive aspects of archaeological knowledge production, it is necessary to identify the actors involved in the "universe of discourse" (Strauss 1978). To accomplish this, I draw from social worlds/arenas theory, which focuses on commitments to collective action as a crucial element in understanding the development of social structures (Clarke and Star 2008). As a pragmatist and ecological means of analysis, social worlds/arenas theory allows me to investigate the interfaces among archaeologists working in different capacities towards mutual interests.

In this chapter, I identify various sub-worlds, or domains of archaeological work, that comprise "specialized concerns and interests within the larger community of common activities. These act to differentiate some members of the world from others" (Kling and Gerson 1978: 26). I identify series of work roles, tools, modes of interaction, aspects of research environments and held values associated with a few domains

of archaeological work, namely project management, fieldwork, specialist activities, and data management. I also account for domains adjacent to archaeological projects with which archaeologists regularly engage, such as the notional archaeological community at large, general publics, and various elements of research administration and infrastructure.

5.1 Archaeological project management

The archaeological project is central to how archaeologists organize themselves and the knowledge that they produce. Archaeological projects are discrete collective entities with the authority to investigate a particular archaeological assemblage, often, but not always, associated with a bounded location known as an archaeological site (Dunnell 1992). They exist to ensure that the conduct of archaeological work is well coordinated, that participants follow accepted epistemic values, and to serve as institutional vehicles that help legitimize participants' contributions to archaeological knowledge. A project's identity is thus intrinsically linked with the authority granted to a team of individuals to generate new knowledge.

As with all kinds of projects, archaeological projects are organizational systems that support productive cooperation concerning communally held goals and objects of interest (Carver 2010: 335-336; Strauss 1988: 165). This section describes how the three archaeological projects investigated in this study are established, and accounts for directors' roles in ensuring the production of knowledge and its assembly in a coherent and purposeful manner. This contributes to a discussion on how projects are bounded, and the implications pertaining to notions of ownership and control over the information that projects produce.

5.1.1 Establishing the project

A project's operational license is, as a rule, granted by state agencies, which either directly allocate funding and research permits or regulate the conduct of privately funded archaeological work. However, in my discussions with project directors at the cases I observed, who are typically responsible for obtaining funding and work permits, they have indicated that they consider their projects as largely mandated by a broader community of archaeologists, rather than by the state.[A1, C1] For instance, Basil, who directs Case A, highlighted how the participation of other archaeologists on government review boards, who evaluate proposals on behalf of the funding agency,

influenced his application, stating that he "categorically didn't lead with 'we're going to show [a particular conclusion]'," and instead opted for a more open-ended objective whereby he could "shed light on either [outcome]".[A2] Basil explicitly avoids taking sides in a heated debate, while maintaining the perception that his project will generate valuable knowledge. Proposals therefore relate the work within professional and epistemic discourses, which carry their own implicit value regimes for the evaluators to consider.

That being said, Knapp and Antoniadou (1998), Brown (1998), Hodder (1998), Shepherd (2003), and numerous others have identified ways in which both state and local politics influence what research is pursued. Some jurisdictions limit the number of permits for projects sponsored by foreign institutions to encourage the growth of local archaeological communities (Hodder 2003). This encourages reviewers of proposals to align their evaluation criteria with those of the granting agency, and also with the discursive milieu in which the project presents itself.

A specialized genre of academic writing has emerged that focuses on optimizing rhetorical and procedural aspects of grantsmanship in a way that complements the criteria set forth by common granting frameworks. For instance, in her study of European Union funding application procedures, Niklasson (2016: 162-164) identifies "application poetry" as language included in funding applications that caters to the vague and trendy priorities held by funding agencies. While my account of archaeological grantsmanship is limited to retrospective discussions in interviews with project directors at my three cases, further work that follows the application process would certainly provide much more insight regarding archaeology's situation in relation to broader socio-political value regimes.

Across the three cases examined in this study, the ways in which archaeological projects are pitched or presented reflects directors' recognition of what their discursive partner expects and values. Moreover, the bureaucratic structures in which archaeological projects participate serve to clearly demarcate the boundaries of the project's scope and orient it towards stated goals. This has a stabilizing effect that makes the project seem more legitimate.

5.1.2 Assembling the project system

After receiving funding and operational license, the project is then initiated under the leadership of the person who developed the application. This person is known

as the project director, and leads in all aspects of work.[B1, A3] In some cases, two or three people serve as co-directors, and directors are often supported by one or two "point men"[5] who lead the implementation of directors' decisions.[, C2, C3, C4] These "key individuals", who are located "on the ground", have "hands-on experience" with all aspects of a project's operations.[C4]

In the cases I observed, the concentration of administrative responsibilities is assumed and tacitly imposed by the administrative bodies to which archaeological projects are accountable, namely university administrations, regulatory bodies, and funding agencies.[A4] Having a project represented by a singular voice makes it functionally easier, at least bureaucratically, for these administrative bodies to welcome funding applications, audit financial transactions, and follow up on research progress.[C1] The organizational structures in these archaeological projects are thus shaped by power relations with state and funding agencies, following processes of institutional isomorphism that DiMaggio and Powell (1983) first described to account for the uniformity of corporate and state structures in relation to the emergence of 20th century global trade.

In their capacities as leaders, project directors are responsible for recruiting a project team, which comprises people applying various tools and methods to examine the site's material assemblage in complementary ways. As Basil recalled, "you try to dovetail as best as possible, with like, these are our research questions, these are the methods we umm aim to employ to answer these research questions, and here are the specialists who are capable of wielding those techniques."[A1] The director must also ensure that team members are equipped to do their work effectively, and establishes organizational frameworks, standard terminology, and normative procedures to enhance coordination across the distributed work environment. Archaeological projects thus uphold organizational structures that grant roles and responsibilities to various individuals and coordinate the contributions of participating members. Basil recalled having to manage conflicts among specialists who are working with similar kinds of material, recognizing the need to establish clear boundaries, saying that it is necessary "to be more clear up front in terms of this is my expectation of you, what's your expectation, this is yours, this is common".[A5]

5. This gendered wording extends from common use of military metaphors and imagery, especially in fieldwork settings. This research did not explicitly aim to address gendered aspects of archaeological practice, and I am not equipped to grapple with these important themes. See Joyce (2009: chap. 2) and Gero (1985) for salient discussion of masculine and militaristic imagery in archaeology.

Basil noted his role in enforcing some standards across specialists who examine the archaeological material to ensure that their data are amenable for integrated analysis.[A6] He recognized that, without his leadership, the dataset would be less useful for addressing the research objectives, and that, as director, he was singularly capable of tying these disparate strands together. Directors therefore have authority to establish communal data streams where all information generated by participating members resides, and to enforce protocols that ensure that the data created by people working with relative independence are compatible.

In coordinating work in this manner, the project directors I spoke with identify and relate various work activities by establishing organizational frameworks that affect how labour is distributed and how the products deriving from work should be created, presented, extended, and valued. This is in line with what Shanks (2007) describes as the "art of anticipation," whereby archaeological projects are framed as sociotechnical systems comprised of distributed sets of human and non-human actors working towards a common research agenda. These systems are assembled in a manner that anticipates the world that the director expects to encounter and the ways in which the archaeological materials the project recovers may be put to good use. Shanks (2007) further notes how the strong and top-down mode of control that directors hold over archaeological projects makes this possible, and concurs with Strauss' (1988) account of project articulation as a manipulative affair, whereby leading figures coerce interaction among participants according to their vision of how the work should proceed.

5.1.3 Project ownership and control

Although project directors may have influence that stems from their archaeological expertise and seniority in the community, their control over the scope of work is a more fundamental source of authority. As noted in the prior sections, in the cases I observed, directors' roles as the project's primary representative in bureaucratic and discursive milieux enables them to stabilize the project's objectives and legitimizes the plan of action towards targeted ends. After setting a project's overall objectives, directors are then granted authority to assemble a system that enables them to be met. This involves allocating tasks and responsibilities, and enforcing certain protocols and practices in service of their vision of how the project should proceed. Moreover, publications that present findings derived from the project typically require directorial sanction.[B1] As with corporate enterprises, ownership over a project is thus reified

by the ability to direct the firm towards particular ends, to establish the firm as a sociotechnical system designed to attain those goals (including the ability to hire and fire personnel and dictate what tools should be used), and to control the distribution of tangible outcomes. Moreover, like a corporate firm, an archaeological project's boundaries are defined by what constitutes the property of the owner.

This extends to the information that a project produces. In an unrecorded conversation, Rufus, who is one of Case B's two co-directors, noted how the project director plays a fundamental role in framing how knowledge is structured. He went on to argue that because directors devote their lives to their projects, they are entitled to preferential access to the data that they assembled before making them openly available for use by others.

Case C's primary challenge of fostering more direct collaborative ties between distinct archaeological projects helps illustrate this. Case C draws together the work derived from independent projects, each with their own sociotechnical systems assembled to address their unique research objectives. An immediate tension emerged from the attempt to fit these projects within a new sociotechnical arrangement, controlled by a new, higher authority. George, who is Case C's principal investigator, is very aware that certain similar efforts are trying to "consolidate an expanding body of data that essentially one person or one institution is hoping to manage or control," and actively seeks to distinguish Case C by assuring members that "participating projects and researchers continue to retain absolute control of their data" and will be able to "control who has access to it in a highly granula[r] way".[C5] This fixation with who has the right to make use of a dataset warrants further attention to the relationship between ownership over data and the setting of a project's boundaries.

Case C's success partly depends on the social bonds that already existed among the project leaders, who all work within the same region. This helps foster a sense of trust:[C6] according to George, "we could build a kind of informal network ... where we trusted each other because we knew each other and collaborated in various ways over the decades".[C7] Moreover, participating in Case C is more than just data integration, but represents a partnership between the independent projects and the collective entity. Funds and personnel are allocated from the central Case C grant to facilitate this integrative work, and opportunities are extended to analyze the collective dataset.[C1] In fostering true collaborative relationships, as facilitated through Case C's centralized administrative structure, participants are taken seriously as partners

who contribute more than just their fungible data, but the tangible outcomes of years of work, which they have consolidated as their own property. Bevan (2012) argued that a similar recognition of the social implications of increased adoption of open data infrastructures, which threatens to transform extant power relations and value regimes, is needed to ensure that all stakeholders not only tolerate, but value these novel modes of information exchange.

Alternative visions of how to manage archaeological projects have been posed, and to a certain degree, experimented with. The principals of the Çatalhöyük Project, for instance, sought to extend interpretive potential among a larger set of stakeholders, including fieldworkers, support staff, and members of the local community (Hamilton 2000; Farid 2014; Mickel 2021). However, final authority still rested at the top, and there is considerable debate regarding whether this amounted to any significant change. Shanks (2007) proposed the iterative agile project management framework, most prominently adopted among software developers, as a potential way forward. While agile, if done correctly, may lead to more ground-up decision-making in line with pragmatic concerns, its processes are also highly susceptible to being co-opted to operate in a hierarchical fashion while maintaining a superficial veneer of pragmatic, grassroots values (Mesquida Calafat, Mas, and Pacheco 2022). Additionally, Thorpe (2012) and Eddisford and Morgan (2019) argue that a shift in more fundamental sociopolitical praxis in all aspects of life is necessary to effect change and bring about more egalitarian modes of archaeological project management.

5.2 Fieldwork

Archaeological fieldwork is a domain of archaeological research that occurs "out in the field" – any place where past people left behind material remains – and where fieldworkers collect and record archaeological and ecological materials for further study. As the primary domain under which archaeological evidence is constituted, in the cases I observed, fieldwork is generally considered a core aspect of the discipline, and often as a root on which subsequent work depends and from which it is derived.[A7, A8, C8, A9] Fieldwork typically takes two forms, excavation and survey. Excavation involves probing the earth to document archaeological materials as part of stratigraphic sequences, while survey emphasizes collecting and identifying archaeological materials on the earth's surface and situating them as part of the built landscape. Survey sometimes also involves subsurface data capture through less intrusive work like shovel testing,

augering, or test-pitting, or by using geophysical imaging methods like ground penetrating radar. Although the projects that serve as cases for my research have employed systematic surveys in the past, and have performed survey on a much smaller scale during the course of my observations, the data I collected is predominantly based on observations of excavation practices.

Fieldwork, especially when it involves excavation, is emblematic of the discipline among the general public, but archaeologists also generally consider it necessary for all archaeologists, including those who work mostly in laboratory or museum settings, to have gained experience in excavation or survey at some point. As I will demonstrate with evidence from my case studies, the mandate to experience fieldwork is more than just a right of passage; in fact, it helps instill an intuitive understanding of the core challenges that disrupt idyllic notions surrounding the nature of archaeological data.[A10]

5.2.1 Practical and DIY work ethic

Fieldwork tends to occur outdoors, often (but by no means exclusively) in remote places where humans once lived but have since abandoned (see Figure 5.1). Though urban fieldwork is common, it was not practiced in any of the cases I examined. In general, however, fieldwork involves establishing a controlled working environment in settings that may not easily support scientific intervention upon archaeologists' arrival. For instance, archaeologists often have to obtain permission from local landowners to work on their property, and modify the physical environment to facilitate their work, for example, by clearing weeds and surface debris, or by breaking boulders that would inhibit excavation.[A11, A12, A9, A13] Fieldwork thus depends on the social and natural forces that shape local landscapes, and that impose limits upon the kinds of investigations that archaeologists are keen to make.[A14]

To cope with these kinds of challenges, archaeological fieldwork has a practical, hands-on work ethic. Although fieldwork can be slow and meticulous compared to the range of possible ways forward (i.e. removing sediment by hand with a trowel or mattock, rather than using heavy equipment), there is also a strong impetus to work quickly, particularly in commercial archaeology.[A15] Experienced excavators are able to recognize when it is necessary to change gears, and are able to balance care with speed. Moreover, fieldworkers typically focus on getting the job done cheaply by working with the tools and resources that are on hand and within budget.[A16, A17, A11, B2]

Figure 5.1: A cluster of trenches at Case A.

In this vein, fieldwork tends to use flexible tools that participants can wield in various ways or can modify for use in various circumstances.[B2] These tools typically derive from non-archaeological occupations, such as the construction or forestry industries, and are easy and inexpensive to purchase (and replace) from hardware stores.[A18, A19] At Case A, where the soil is quite rocky and dry, fieldworkers prefer to use a hand tool designed for stripping wallpaper instead of the more typical mason's trowel.[A20] They

prefer to use tools that are relatively easy to repair or modify for optimal use; trowels can be sharpened, the worn-out grip on a sledgehammer can be replaced with scrap rubber, and buckets can be patched with duct tape.[A21] Simple tools and materials are often recombined on the fly to serve practical and often one-off functions (cf. de Laet and Mol 2000).

A great example of this is how Theo, a very experienced trench supervisor who would also eventually become Case A's field director, found a way to extend a rod so that he could take accurate measurements. This is elicited in Excerpt 5.1.

Excerpt 5.1. Notes on fieldwork's practical work ethic.

> After hammering in the rebar and vertically aligning the string, it is only level at a point that is higher than the rebar. He told me to go grab the other rebar in the corner, though it is massive. Tried hammering it in, but it was clear that it would get blown over by the wind. I offered to hold it steady but instead he told me to rummage in his bag and find a nail and masking tape. He attached the long nail to the rebar, adding 4-5 inches to its length. He then proceeded, with my assistance, to tie the string around the nail, clip it on securely, and secure the line down with a rock. Regarding securing the line down with a rock, this was a challenge for me yesterday, as well as when I did this for the earlier section this morning. I needed to find the right kind of rock, which was not too big, but still dense. It needed to be not too rough, but with sharp angular corners. This was never made explicit; after two failed attempts, first with a large rugged rock, and then with a smaller, less rugged rock, he picked up one and gave it to me, saying "something like this". I wound the string around it, leaving some slack, and then positioned the rock in a way that would render the line taut, by rotating it or securing it around others.[A22]

This anecdote illustrates the improvised and iterative process of assembling a practical workaround for a minor problem. We try working with various combinations of materials, from Theo's own toolkit and from the natural environment, to extend the length of the rod and ensure that it can stand steady in the wind. This work was driven by a desired outcome, and was both constrained and made feasible by the materials that were available at hand. Based on his experience, Theo assessed the situation and extended the rod in a way that enabled him to achieve his objective without introducing confounding factors that would prompt others down the line to

question the record he produced.

In fieldwork, things need to work during the moment you need them. For instance, Liz, a very experienced trench supervisor at Case B, expressed frustration with "get[ting] ... iPads to communicate with each other" as a key reason why these tools have not yet been widely adopted in archaeological fieldwork.[B3] Similarly, Paul, who develops the data management platform used by various projects affiliated with Case C, noted that "You have to go into that environment ready to hit the ground running" since "the field environment is too fast-moving and ... hectic".[C9]

5.2.2 Divisions of labour in fieldwork

Most archaeological fieldwork is organized according to a hierarchical structure (see Figure 5.2). The project director designates a field director who oversees all fieldwork. A series of supervisors, who are usually graduate students or experienced fieldworkers, lead and coordinate data collection in specific trenches or areas of a site. Assistants, who are usually less experienced students or local labourers, operate under the guidance of their assigned supervisors. In some large projects, though not in any of the cases that inform this dissertation, field supervisors oversee work pertaining to several trenches in a particular area, and mediate between trench supervisors and field directors. Some specialists, including conservators, photographers, and those responsible for collecting spatial data, also work in field settings.

In my case studies, the field director serves as the primary liaison between all fieldworkers and the project director.[C10, B1, A23] Project directors rarely immerse themselves in fieldwork due to their numerous other project management obligations, despite their usual desire to engage directly in the data-collection process.[A24, A25, C10, C11, A26] Field directors are hired to make key decisions in place of the project directors.[C10] They spend all their time on site, and are attuned to the progress of fieldwork on a day-to-day basis.[A27] Field directors tend to be involved in planning that has important consequences for the substance of the research, namely in identifying where new trenches or survey areas should be initiated, and how to allocate human resources so that work progresses in a timely manner.[A23] Moreover, field directors are responsible for ensuring the safety of all fieldwork personnel, and must weigh the practicality of work with the project's needs.[A28, A23]

Field directors are seasoned fieldworkers with practical skills and the ability to improvise in unpredictable work environments.[A23] They tend to be personable and

upbeat, and good at finding solutions rather than being held up by obstacles.

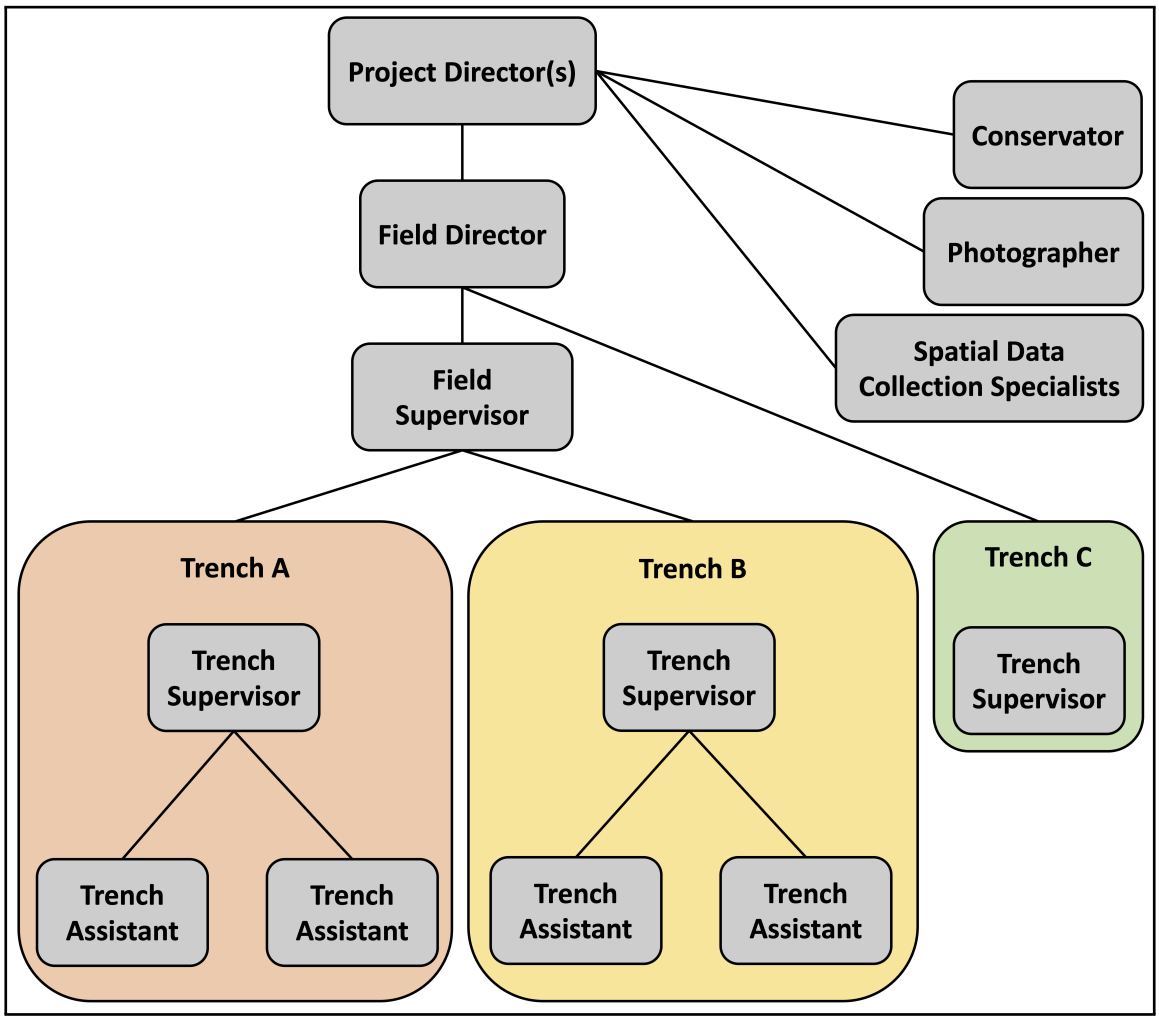


Figure 5.2: Organization chart pertaining to fieldwork.

Field directors are not necessarily appointed formally. In many cases, the most experienced excavator from the project, who has the greatest familiarity with the site and with fieldwork procedures, is called upon to address questions that other members of the staff may have, and the project director consults this person about strategic matters, thereby taking on the mantle of field director. In such cases, as encountered in my case studies, the people carrying out these tasks are simply trench supervisors who have taken on a leadership position among their peers.[A27, A28] For example, although Liz is not formally recognized as a field director, she seems to operate as if she were one due to her extensive field experience, her participation in Case B during the prior fieldwork season, and her greater involvement in relevant professional networks.

Field supervisors tend to be graduate students or senior undergraduate students who are responsible for directing work in a specific trench or area of the site.[C12] Typically recruited through professional networks, their position is generally considered as an opportunity to develop their fieldwork skills and obtain experience that will advance their careers.[A29, A30, A31, A32, A33, B4] Supervisors oversee day-to-day work in the specific space they are assigned, which they carry out together with assistants assigned to them by the project director, although in some cases they work on their own, without assistants.[C12, A34]

Supervisors are responsible for establishing primary records about the materials recovered from the areas assigned to them and about the work undertaken to collect this information. Supervisors typically have a great deal of independence over the work that they do, and establish a deep sense of familiarity with the trenches or tracts of land under their care. Supervisors are careful to respect the dominions of their peers, and are hesitant to offer unsolicited guidance to other supervisors or to criticize each others' work without sufficient reason or provocation.[A35] Even project directors are hesitant to step on the toes of field supervisors, always taking care to consult with them before making key decisions that will affect their work.[A3] This is not just a professional courtesy; project directors place a lot of stock in supervisors' capabilities and degree of familiarity with their assigned trenches or survey tracts, recognizing that they spend most of their time in the field doing hard labour, and generally without any monetary compensation.[A36, A37]

Field assistants are typically less experienced undergraduate students or local labourers whom the project director hired.[A38, A39] Despite the benefits of having assistants remain fixed in a trench or area of the site, it is common to shuffle them around to accommodate changing labour requirements.[A40, A41, A42, A43] This includes allocating assistants to finds-analysis labs or in the dig house to do miscellaneous tasks adjacent to fieldwork. These are often highly repetitive tasks that require minimal training. Senior project staff and assistants alike attribute this mundane and repetitive engagement with materials as a key aspect of their training, which plays a significant role in advancing a student's understanding of the materials they handle.[A44] In this capacity, assistants engage as legitimate peripheral participants, as characterized by Lave and Wenger (1991) and as documented in depth by Goodwin (1994, 2010) and Edgeworth (1991). Over time, novices become more proficient at implementing technical tasks, and through doing this work in social settings, where peers and supervisors provide feedback, share cautionary tales, and tell jokes in ways

that highlight and test the boundaries of acceptable discourse and behaviour, pupils develop a sense for the practical, professional and epistemic implications of their work.

However, assistants' status as learners is sometimes formalized in projects that operate as field schools. These are associated with university departments and train students as part of the academic curriculum. Field schools often hire an additional teaching director to liaise between students and senior project staff and to evaluate written assignments or hands-on procedures that students perform in relatively controlled circumstances. On field schools, my evidence confirmed an expectation that supervisors will be more explicitly instructional while directing work in their trenches, and they typically grade students on their performance.[A45] However, other scholars have noted significant limitations with the actual implementation of fieldwork on these projects. Everill (2007), Holtorf (2006), Yarrow (2006: 24-25) and Batist et al. (2021: 1743-1744) highlight the general reluctance to allow students to be more involved in the creation of formal records and in analysis, both of which involve contextualizing fieldworkers' extremely limited window of engagement within broader structures and narratives. Exposure to fieldwork is indeed quite valuable for honing one's skills in a technical sense, but, as J. E. Perry (2004) notes, participating in fieldwork is valued more as a means for developing an intuitive understanding of how archaeological tasks fit into broader contexts of knowledge production. When learning a skill in isolation, a student is not afforded an adequate understanding of the task's broader implications. Only through play, or low-stakes experimentation such as that which is afforded through legitimate peripheral participation, can a student come to terms with the agency that they wield while performing their actions.

5.2.3 Social aspects of fieldwork

Cultural and historical factors such as archaeology's history as a vector of colonial exploration and exploitation, the sense of *machismo* associated with physical labour in frontier environments, and the underdog pride of working with extremely limited budgets and resources play a major role in establishing fieldwork "vibes", particularly in cases where projects sponsored by North American and Western European research centres operate in other parts of the world, as is the case with all the projects I examined here (cf. Moser 2007; Chadha 2002). These conditions under which fieldwork tends to occur distinguish it from other kinds of work that occur in other research settings, such as laboratories or university office space.

Fieldwork is a setting where a methodologically diverse group of people come together with some sense of common purpose. The field is a locale where members of international teams sporadically converge and where life-long friendships, research partnerships and even romantic relationships are forged. It is a setting where experimental methods are attempted, and where unprintable stories and gossip originate and are retold. Rough living in close quarters also sometimes yields personal and professional conflicts. Regrettably, traumatic experiences including harassment, bullying, and acts of discrimination may also occur (see Voss (2021), Moser (2007), Klehm, Hildebrand, and Meyers (2021), and Archaic Inquiries (2019) for more in-depth discussion on these issues).

For better or worse, these shared experiences contribute to a sense of solidarity that produces tangible outcomes. In my cases, I observed that project teams, which may be working on similar kinds of material at different sites within the same region, may call upon each other to provide support by sharing tools and insight.[B5, A46] Sometimes, multiple projects use communal workspaces to examine finds.[B6, A47] Students are also sent on tours to other nearby archaeological sites, which broadens their educational experience to include a brief understanding of how archaeology is done elsewhere.[B7] Graduate students often get together and form long-lived friendships through informal social gatherings among project members.

J. E. Perry (2004) and Heath-Stout and Hannigan (2020) similarly argue that fieldwork, and field schools in particular, are crucial settings for professional development. Participating in fieldwork exposes junior scholars to the research community in a relatively informal setting, and presents opportunities for them to demonstrate their skills and their value as contributors to archaeological work. Moreover, participating in fieldwork helps to socialize junior scholars as members of a disciplinary culture by instilling an intuitive understanding of how to ask the right questions and of the potential value and limitations of a wide array of archaeological methods and evidence.

5.2.4 Learning to see like an archaeologist

Fieldwork is often a setting of informal learning, where novices learn to perceive the world and act as archaeologists. Here I describe a series of episodes where Jane, a promising trench assistant working at Case A, learns to identify, differentiate, and document parts of a stratigraphic sequence. These examples illustrate how the constitu-

tion of the archaeological record, and the internalization of archaeological knowledge, occurs as part of project frameworks and collaborative relations that are structured by projects' divisions of labour.

As illustrated in Figure 5.3, Jane explains to me how she identifies and differentiates a new context that she is beginning to expose in her trench, using a series of gestures paired with speech to help convey what she means to say.[A183] Jane kicks the boulders as she refers to them, literally points out relations to previous experiences that she deems relevant, and describes certain aspects of the soil by miming the ways that she would interact with them. Jane refers to common nomenclature outlined in the project's excavation manual, and draws from her experiences working in other trenches that others may not share. More generally, she describes the context change only in terms of her interactions with it, and as framed by her particular role in the project.

Afterward, and as illustrated in Figure 5.4, Jane consults with Basil, who supervises work in this trench, regarding her interpretation of the soil in it.[A184] Jane explains what she sees, in terms of her encounters with the entities she identified, while punctuating her observations with physical gestures that underscore certainty that the entities she is observing actually exist. Basil comes to take a closer look and translates Jane's situated experiences into more nominal and normalized terms, that distance the observer from the observed entities. Basil then identifies a series of actions that Jane must implement, and summarizes the situation by joining what was observed with what is to be done about it, in effect rendering a conclusive and well-reasoned decision. All the while, Jane confirms her understanding of Basil's corrections and of his specific instructions.

As Basil seems to have predicted in their conversation, the context did not end up changing that day. However, the tentative decision to proceed as if a change in context was imminent left residual traces on recording sheets, in the database, and in the final trench report. As per the context recording sheets (Figure 5.5, also transcribed in Excerpt 5.2), including a sketch of the base of the trench (Figure 5.6).

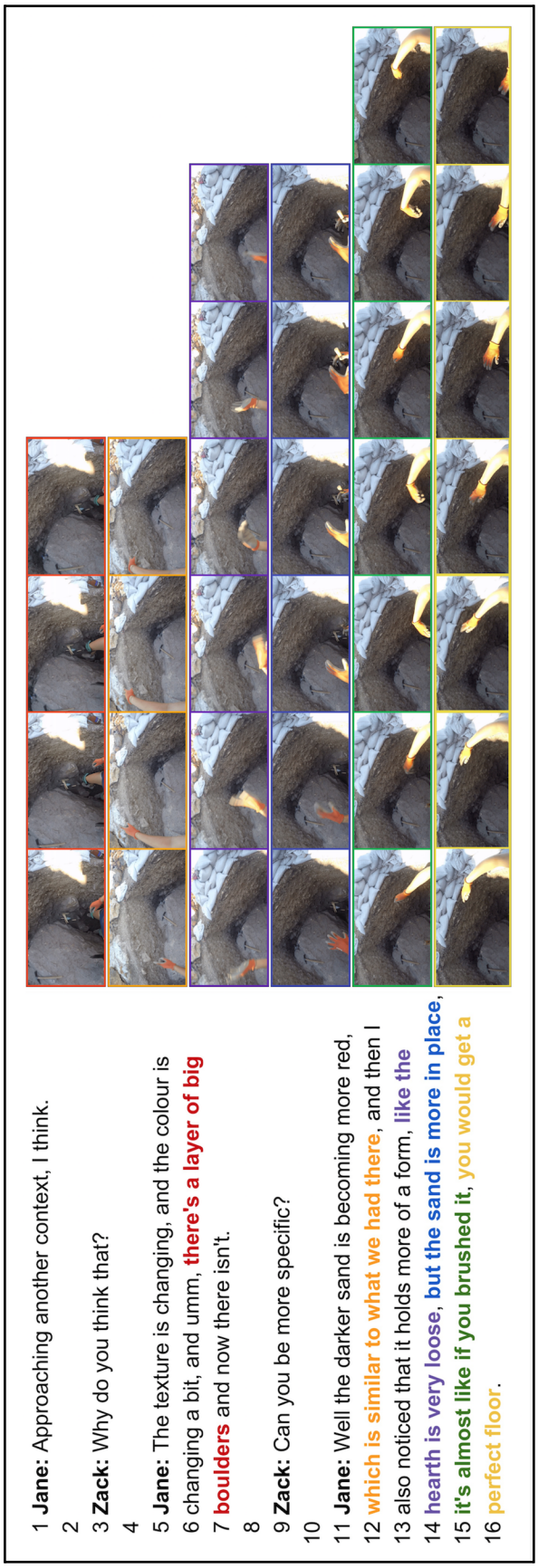


Figure 5.3: Explanation of a potential context change using gestures and speech.

Jane : So, this is like still kind of a dark, dark brown, going into the sand, but it's like really tough, like hard to dig through, kind of. So I think maybe it's just context [?]. *((gesturing towards other side of the trench))* And then this is like really light grey, *((bobs hand up and down to emphasize these last three words))* and I thought it was just cuz it had just dried out, and I hadn't done this kind of [fill], but it's also really hard to dig, and like a really light grey, so I don't know if it's just remnants of this part, or what...

Similar kinds of gestures used to lonacterize and relate objects of interests to others; gestures underscore certainty that an entity actually exists

((Basil gets in the trench to take a closer look))

Jane: Or like maybe this is like, would it be possible that that's like an older hearth, like the other one that was leached out?

Basil: Yeah, hmm. So the colour here is the same as what you were digging, but the consistency has changed?

Jane: Yeah.

Supervisor translates experience into more nominal and normalized terms

Basil: I would clean up, maybe just straighten that section a bit, [

[**Jane:** yeah

just to the depth that you started at for this context, [

[**Jane:** yeah

Confirmation of understanding after every component of the detailed work plan is stated

and then we'll clean up and carry on with... you know we can just write in the text that, you know, these are the differences, [

[**Jane:** yeah

but you know what, after we start to dig it it might change back to something much more familiar, [

[**Jane:** yea

and we can just say oh, it's like some kind of differential lens of material within it, [

[**Jane:** right

yea, or quite possibly a continuation of what we had before... [

[**Jane:** okay

Confirmation of understanding after every component of the detailed work plan is stated

Jane: Okay, so just clean up the walls, and then keep going, okay.

Basil: Yeah, but we can photograph, change numbers

Jane: Oh, okay.

Supervisor translates future plans into actionable tasks

Basil: We'll treat it as something different, you know we can write in the notes that there is a very good chance that it's still the same stuff, but the consistency changed [

[**Jane:** right

so, just to be careful.

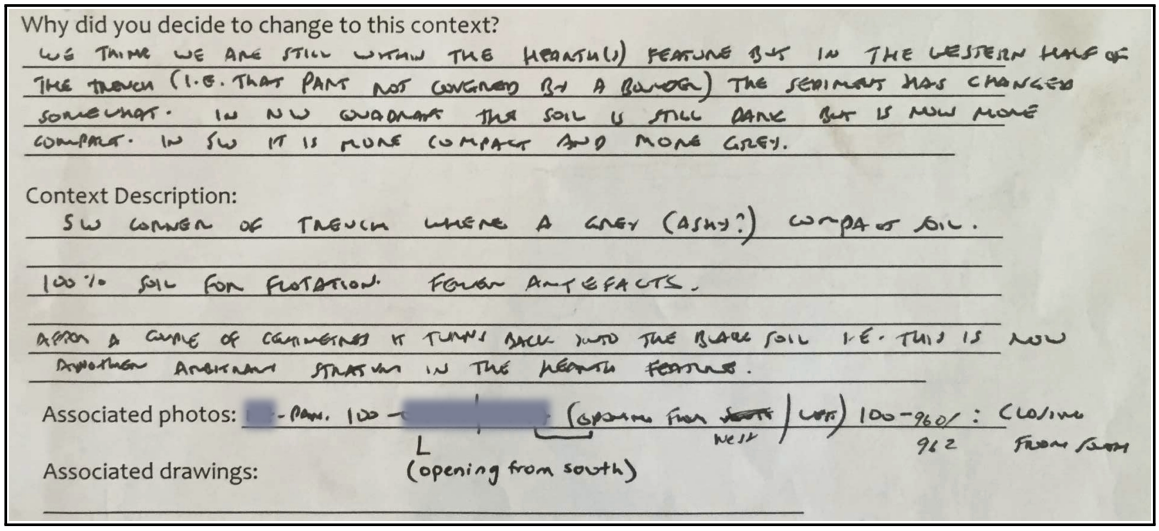
Joins what was observed with what is to be done about it; renders a conclusive and well-reasoned decision

Figure 5.4: Discussion of a potential context change using gestures and speech.

Excerpt 5.2. Section of a recording sheet describing a context.

Why did you change contexts?
We think we are still within the hearth(?) feature but in the western half of the trench (i.e. that part not covered by a boulder) the sediment has changed somewhat. In NW quadrant the soil is still dark but is now more compact. In SW it is more compact and more grey.

Context description:
SW corner of trench where a grey (ashy?) compact soil. 100% soil for flotation. Fewer artefacts. After a couple of centimetres it turns back into the black soil (i.e. this is now another arbitrary stratum in the hearth feature).


Why did you decide to change to this context?
WE THINK WE ARE STILL WITHIN THE HEARTH(?) FEATURE BUT IN THE WESTERN HALF OF THE TRENCH (I.E. THAT PART NOT COVERED BY A BOULDER) THE SEDIMENT HAS CHANGED SOMEWHAT. IN NW QUADRANT THE SOIL IS STILL DARK BUT IS NOW MORE COMPACT. IN SW IT IS MORE COMPACT AND MORE GREY.

Context Description:
SW CORNER OF TRENCH WHERE A GREY (ASHY?) COMPACT SOIL.

100% SOIL FOR FLOTATION. FEWER ARTEFACTS.

AFTER A COUPLE OF CENTIMETRES IT TURNS BACK INTO THE BLACK SOIL I.E. THIS IS NOW ANOTHER ARBITRARY STRATUM IN THE HEARTH FEATURE.

Associated photos: [redacted]-PAN. 100 - [redacted] (OPENING FROM ~~SOUTH~~ NEW / WEST) 100-960/962 : CLOSING FROM SOUTH

Associated drawings: L (opening from south)

Figure 5.5: Section of a recording sheet describing a context.

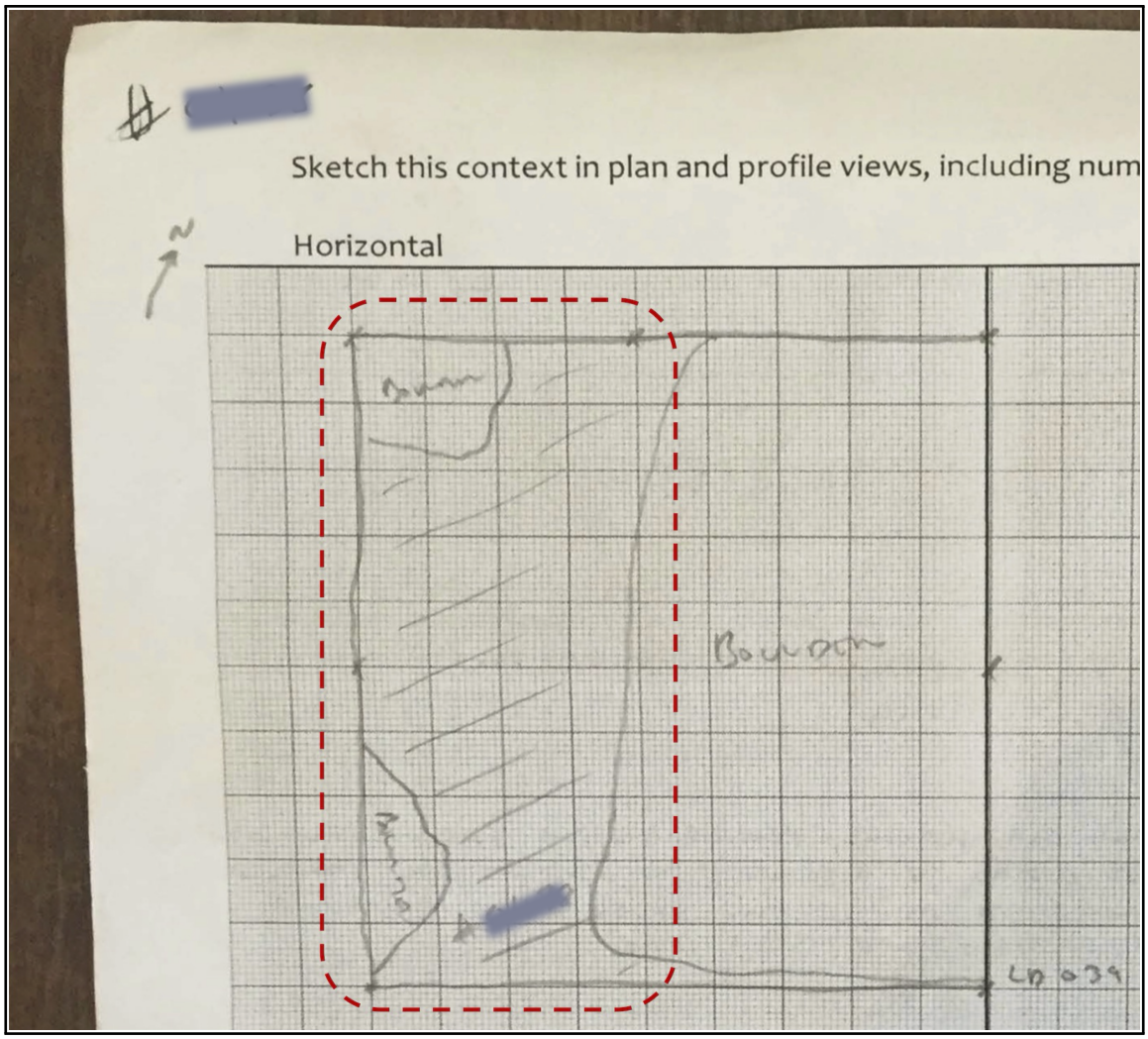


Figure 5.6: Sketch of the base of a trench, portraying the context addressed in the observed episode, boxed in red.

The tentativity and ambiguity that Jane and Basil experienced while excavating this trench is one of its notable properties, as described in the final trench report (Figure 5.7, also transcribed in Excerpt 5.3).

Excerpt 5.3. Section of a trench report describing a context and situating it as part of a lithostratigraphic unit.

> The sediment in this context had changed a bit but we assumed we were still within the hearth(s). It appeared more ashy so we described it as a new context. However, after a couple of centimetres it turned back to the darker soil so it was then decided that this was indeed a continuation of the hearth. It was then

considered an arbitrary change of context. Overall, it was grey ashy soil with angular and fairly compact stones, it was medium/fine sand, poorly sorted, and 10YR 4/1. 100% of this was also taken for flotation. The boulder begins to drop off here and does not take up any more of the trench. No sediment from beneath this large boulder was taken. However a new smaller boulder can be seen in the middle of the remaining open western side in Figure 17 and more exposed in Figure 18.

Context ( ); LU ( )

The sediment in this context had changed a bit but we assumed we were still within the hearth(s). In the northwest quadrant the soil was still dark but was now more compact and in the southwest it was also compact but more light grey in colour. It appeared more ashy so we described it as a new context. However, after a couple centimetres it turned back to the darker soil so it was then decided that this was indeed a continuation of the hearth. It was then considered an arbitrary change of context. Overall, it was grey ashy soil with angular and fairly compact stones, it was medium/fine sand, poorly sorted, and 10YR 4/1. 100% of this was also taken for flotation. The boulder begins to drop off here and does not take up any more of the trench. No sediment from beneath this large boulder was taken. However a new smaller boulder can be seen in the middle of the remaining open western side in figure 17 and more exposed in figure 18.

Figure 97; context ( ), opening, photo from the west, 1000747

Figure 5.7: Section of a trench report describing a context and situating it as part of a lithostratigraphic unit.

It is notable, however, that these contexts were eventually lumped together into a more concretely defined "lithostratigraphic unit," which was described in a formal manner using nominal and standardized terminology. In general, this text switches back and forth between ambiguous and concrete description, which convey experiential and distant perspectives, respectively. This resembles the tone switching that occurred in the conversation between Jane and Basil, whereby Basil, as supervisor

responsible for creating formal documentation, rendered Jane's experiences in more formal ways.

The conversation between Jane and Basil also served to calibrate their experiences. By talking through their observations in an explicit manner and in the presence of the entities of mutual concern, Basil became more confident in Jane's ability to recognize and report her experiences, upon which Basil depends. This is demonstrated in Excerpt 5.4, when Jane revealed her own perspective on how she learned to see context changes.

Excerpt 5.4. Learning to see like an archaeologist.

Jane: . . . it's always hard to like train your eyes to see certain things. Like sometimes Alfred would like take out a handful of sand and go like do you see the red flakes? and I would be like no. Or even like, pointing our stratigraphy, like see how this changes to this level, and it just kind of, **training your eye to see what they're seeing** is, sounds like an easy thing but it's actually hard to like, kind of, **pick out things that they want you to pick out**. And I think like now it's easier to like, oh, see how that's transitioning, or like, umm, even just like comparing peoples' trenches and like the contexts they're in, **it's easier now but at the start it was like, it looks the same to me, or like I don't spot what you're spotting**, you know? And it's just a way of looking at things that I think that's the hardest part for me.

Zack: Do you know how that developed?

Jane: I think just like **repetitive, like every day, looking at stuff**, I think is like, just a good way of learning. I don't know if there's something specific but. . . and just hearing from like, **hearing Alfred pointing it out, hearing Basil pointing it out, hearing different supervisors pointing it out**, it was just different ways of explaining it or showing it to you that **it starts to kind of, like, produce a form of knowledge**. Umm, but I dunno.[A44]

Jane revealed that she initially found it difficult to "train her eye to see what they're seeing", and "they" seems to refer to more senior and specialized archaeologists, including her supervisor the director, and Alfred, the field director trained

as a geoarchaeologist.[A44] This relates to the scenes just described above, where Jane explained her interpretation of the soil to her supervisor, and he then responded with tentative agreement, paired with his own gestures and intonations that subtly communicated his agreement or disagreement. This similarly boosted Basil's trust in Jane "to either make her own decisions or be responsible enough to ask other people to help her make decisions for those moments when I'm not there," as he recalled in a separate interview.[A45]

5.2.5 Expressions of agency in fieldwork

Archaeological fieldwork is responsive to the archaeological finds and constructions recovered throughout the investigation. Although archaeologists surely have certain expectations about how the things they uncover will gradually reveal themselves, fieldworkers working at the cases I investigated expressed the need to follow what is occurring in the earth. They actively try not to think too much while excavating, and to operate in the moment, responding only to what is directly in front of them.[A11, A12]

Clearing one's mind while excavating is an active process, which fieldworkers may facilitate by modifying their work environment or by leveraging certain tools. Some fieldworkers focus better while listening to music or while blocking out social distractions.[A14, A48] Ben, who worked at Case A as a trench assistant and became a supervisor the following season, said that listening to music helps him avoid being too self-aware[A14] while Jane concurred by expressing that she listens to music to help her "get lost in digging."[A48] Even when music is not used, or even when it is forbidden on site, there remains a warrant for fieldworkers to remain focused as they work.[A49] Olivia, a trench supervisor at Case A, emphasized the need to be in the moment and to face the task at hand without thinking too far ahead.[A11] Having all the necessary tools at hand is another way to facilitate uninterrupted focus during fieldwork.[A50]

In some cases, fieldworkers find certain kinds of information useful as they excavate. Knowing about similar stratigraphy in a nearby trench can help field directors decide where and how to open new trenches and plan the allocation of limited resources. Excavators who are fairly certain about the order of stratigraphy can work at a quicker pace.[A51, A52, B8] Moreover, when finds specialists report back to fieldworkers about the contents of their ongoing trenches, their preliminary findings may influence the care with which they excavate and record the trench. Fieldworkers become attuned to particular things they consider worth noticing and which they are able to

distinguish.[A18, A53] While Theo indicates that knowing about the properties of lithic artefacts that lithics specialists deem important helps him undertake his work in a manner that better suits the project's overall aims,[A18] Ben dismisses palaeobotanical insights that the corresponding expert provides as useless to him because he is unable to "see" the archaeobotanical traces as he works.[A21] While this may be merely a practical concern, specifically regarding the microscopic nature of properties that render archaeobotanical remains significant, it would not be absurd to find ways to help fieldworkers make sense of such insights in the field. For instance, fieldworkers may carry a magnifying loupe and reference guide, and be trained to understand how to use them, much as they learn to characterize soil samples in the field, as I described in the prior section. However, this would require that palaeobotanists become more active in fieldwork, such as by training those who excavate and by generally helping fieldworkers understand the value that this data holds. This would contribute to drawing palaeobotany into the domain of fieldwork, rather than as work that occurs primarily in a separate setting and subsequent phase of work, as is the case in the projects that informed this dissertation.

In general then, we see aspects of fieldwork practice that both complement and contradict efforts to enhance reflexivity in fieldwork. The professed desire not to overthink while excavating pushes back against impulses to provide more information to fieldworkers during the moment of excavation (cf. Berggren 2012; Berggren et al. 2015). According to Theo and Ben, fieldworkers operate in a strictly separate role than those who interpret and write about finds, and this boundary feels natural to them.[A54, A55] Rather than ingest loads of additional information, which involves learning how to make sense of it all and find it meaningful in a practical sense,[A56] fieldworkers' go in the opposite direction; they value their extremely embodied experiences with the material that presents them with a unique and proprietary way of knowing that dissipates as they are, as Edgeworth (2003: 109) put it, forced to "[detach themselves] from the task-in-hand to consider the material field from a distance". This means of engagement feels more natural to them, as if unmuddied by reflexive thought, which fieldworkers perceive as a strength. This plays into the ways that they value their contributions as sensory devices, who are capable of seeing things as they really are, as material entities that have not yet been ascribed meaning. Fieldworkers actively hone the illusion of their objectivity, which enhances their value as members of the project and as domain specialists with their own unique mental skills. For example, Theo, who is a very experienced fieldworker, downplays his con-

tribution to the project by stating that his role is simply to "dig holes."[A17, A54] This mirrors behaviour observed at Catalhoyuk, a project that promoted reflexivity in all aspects of data collection and analysis, whereby the pragmatic situations in which fieldworkers excavated and the epistemic implications of destabilizing the backbone of inferred findings hindered the practical implementation of reflexivity in fieldwork settings (Hamilton 2000: 124-126).

Additionally, fieldworkers and project leaders alike consider an individual's personal character as a particularly important aspect of being a good fieldworker. For instance, while working as a trench assistant, Ben worked in what he recognized as two very different trenches whose supervisors operated in very different ways. He began working in one trench, a 4m deep sondage that Eve (a trench supervisor at Case A) initiated three years prior to his arrival. This trench has been excavated by many assistants moving in and out of the trench over this time, including Ben. But, as a promising student, Ben was moved to work in another trench, which Lauren opened earlier in the season and where work was progressing at a relatively slow pace. Whereas Eve was very accommodating to the rotation of new fieldworkers who came to chip away at what team members generally recognized as a never-ending pit, Lauren, a trench supervisor with prior experience but who was having her first season with Case A, worked much more meticulously in her trench and expected her assistants to execute a similarly careful work style.[A57, A58] Although Basil genuinely respected Lauren's autonomy to excavate in a way she deemed fit, he assigned Ben to work with her because he had proven himself as a capable and decisive fieldworker and because he was sure that Ben would contribute to a faster pace of work in Lauren's trench.[A59] Ben's skill as an excavator was matched by, and perhaps linked to, his confident and uplifting personality, which encouraged greater communication and a greater sense of common purpose that drove work forward.[A60] This contributed to a more jovial vibe in this area of the site, which receives more sunlight throughout the day and is generally considered a tougher place to work.[A52, A37, A49]

Moreover, Basil explicitly favoured taking on students whom he characterized as independent and motivated workers, even over archaeology students who excelled in his classrooms but did not necessarily exhibit these character traits.[A61, A62] Basil selected Jane to work as an assistant in a trench that he was to supervise, realizing that as the project director he would have to spend more time out of the field, and wanted someone there who would be able to work relatively independently in his absence.[A63] Jane's responsible personality and no-nonsense work ethic, along with

her clear personal interest in the project's findings and her dedication its long-term success, solidified Basil's faith in her.[A64] According to Basil, "Jane ran with it, and was very professional, very organized, completely trustworthy. I basically, you know, didn't move her around, because it's like if I need to go off for a meeting, I can trust you to carry on, and you're competent in what you're doing."[A64]. As an educator, Basil wants to help expand his students' abilities, but he is also running a research project and not a field school, and his expectations are oriented more towards having a team of professional workers.[A61] At the same time, he wants to motivate his team by making the project a fun place to work, and compares his vision against the "old fashioned" archaeological fieldwork practices at the famous and historical Sutton Hoo project, where "the only sound you should hear is trowel on stone."[A49]

That being said, there are settings where assistants are treated as mere drones. Both Jane and Ben hated working in the museum where they were tasked with moving crates and counting lithic artefacts, which they felt did not allow them to contribute in a meaningful way, by which I mean in a way that leverages their unique capabilities and skills. This was mirrored in the way Case B generally used assistants' labour. Rufus rarely engaged with students directly, and didn't bother to remember some of their names even towards the end of the season. As these students were participants in a field school led by Chris, Rufus was content to delegate responsibility for their education to his partner. The students, meanwhile, were happy to have an opportunity to participate in an archaeological project, citing the lack of such experiences among their peers and the advantage they anticipate having when applying to graduate programs and for advancing their careers. However, from my observer's perspective, students' inability to contribute to the project's findings in a critical or creative manner, and their restricted usefulness as manual labour, was very apparent in comparison with their counterparts at Case A.

Even still, there exist boundaries of allowable discourse that correspond with various ranks within Case A. Each level corresponds with a different community of discourse. Trench assistants talk among themselves about the things they find, and defer to supervisors' contributions as more authoritative than their discussions as peers. Similarly, supervisors often compare notes and draw from each other's mutual support, and their contributions (either written or verbal) are always concerned with their respective domains. It is up to field directors and project directors to tie these individual sets of findings together. Interestingly, attempts to encourage supervisors to do this, as was the case when Basil wanted trench supervisors to integrate lithics

findings into their trench reports, have been met with reluctant indifference, as if acknowledging that this is not their duty and that this contradicts the natural order of things. At a higher level, directors reserve the right to present the work among a broader audience, including the archaeological community and lay public.

5.3 Specialist work

Archaeological projects accumulate large quantities of physical materials that require systematic analysis, using a variety of specialized methods, to provide insight into the lives of past people. These studies are the domain of individuals known as specialists, who have the skills needed to perform such targeted analyses in a scientifically sound manner. Project leaders call upon specialists to examine subsets of materials or apply a defined set of methods in order to obtain a bounded set of information that they may leverage to support archaeological claims.

Specialists are recognized as such on the basis of the detailed and actionable knowledge they hold about a specific kind of thing, process or method. Communities of archaeologists form around a shared interest in these subjects, known as specializations, sub-disciplines or areas of expertise, which develop standards and norms for how to operate and evaluate work. Specialists accumulate their expertise by working as members of both their specific domains of expertise and the archaeological community at large, and draw from both perspectives. Specialists are therefore recognized as authorities on particular subject matter or practical applications, who are capable of ascribing decisive meaning upon a subset of archaeological materials (Wilmore 2006; Yarrow 2006). This section examines the roles that specialists play in archaeological projects and in creating archaeological knowledge.

5.3.1 Kinds of specialist work

Specialists analyze archaeological materials in various ways. Here I identify a few kinds of specialist work occurring in the three archaeological projects I examined in this study, which operate according to different practical and epistemic processes. Each of these produce information with varying functional value, and relate to other processes of archaeological production in their own ways.

Finds analysis comprises detailed examination of archaeological artefacts and ecofacts recovered during fieldwork. It usually occurs in a museum or laboratory set-

ting, where materials are brought from the field and made available for specialized analysis performed by dedicated personnel.[A65, B9, C13, A54] Finds analysis rely on the experience of the specialists who perform the work, which enables them to recognize important features of artefacts and ecofacts and to draw comparisons within and among assemblages.[C14, A66] Their expertise goes beyond simply identifying and comparing nominal characteristics. According to Jolene, a lithicist at Case A, "you really need to have some broader knowledge of the specific period in the region" in order to contextualize the findings in relation to a broader narrative.[A65, A67] Although finds analysis is most commonly associated with the identification and classification of artefacts, similar methods are also applied to examine zooarchaeological, palaeobotanical and geoarchaeological finds.[A66]

Finds analysis expands upon prior cursory classification that occurs in field settings, whereby fieldworkers distinguish materials on the basis of their raw materials. This occurs on the understanding that later well-informed and systematic analyses will glean much more precise information than are prepared to conduct during excavation or survey.[A54, A55] However, it is noteworthy that there is an expectation that fieldworkers will classify finds on the basis of characteristics commonly recognized as more natural (i.e. chipped stone, ground stone, ceramic, bone, etc), while study of their anthropogenic qualities is typically reserved for finds analysis.[A68] While fieldwork deals with *materials*, finds analysis deals with *artefacts* and *ecofacts*. Even when specialists, who are trained to identify the unique character of the finds they recover, work in the field, they operate as fieldworkers. Their actions are constrained by the practical circumstances of fieldwork and the position of fieldwork within a broader apparatus of archaeological knowledge production.

In this sense, the division of labour is partly due to pragmatic concerns, namely the fact that fieldworkers are usually occupied with their own specific tasks that require mental concentration, especially when charged with doing this work quickly (see Section 5.2.5). Moreover, finds need to be cleaned or otherwise processed in some preliminary manner so that they can be properly examined and situated in relation to a broader assemblage (see Section 6.6 for further details on finds processing).[A69, B9] For the sake of efficiency, finds from the previous day's work are typically examined at the same time as new materials are recovered and processed, although materials collection usually outpaces finds analysis. Projects often undertake "study seasons" between fieldwork seasons or after their excavation permits have lapsed, and are exclusively dedicated to analyzing the backlogged materials, whereby "there's just

two or three of us working on one thing at a time, all the space we need, we can use.".[A70, A71, A72]

Archaeometry, also sometimes referred to as archaeological science or instrumental analysis, is another kind of analysis that typically occurs in laboratory settings and relies on complex instruments, which operate in a mechanistic or controlled manner that leverage the predictable nature of various natural or chemical phenomena. For example, radiocarbon and stable isotope analyses, as well as various chemical characterization methods (e.g. optically stimulated luminescence [OSL], x-ray fluorescence [XRF], neutron activation analysis [NAA], mass spectrometry, etc), rely on settled knowledge about rates of radioactive decay or the atomic properties of matter to determine the ages and compositions of various archaeological materials. Similarly, ancient DNA analyses draw upon predictable biomolecular processes to recombine and replicate fragmented DNA samples, which can then be compared against reference materials to identify the biological species pertaining to the beings from which the samples derived.

This work tends to occur in settings that are physically, temporally and socially distant from fieldwork. In some cases, such as with portable XRF (pXRF), technological innovation has made it more feasible to perform certain kinds of archaeometric analysis at or very close to the archaeological site, but this is still an emerging trend and was not practiced in any of the cases I examined. Samples are typically sent out to laboratories, which may be located across the world, and which are contracted to analyze materials derived from multiple projects, usually with a significant temporal delay.[A73, A66] Laboratories typically operate as services and are rarely deeply involved with archaeological projects from which the materials derive, and tend to be unaware of the contexts or circumstances pertaining to the samples provided to them.[B10, A73] According to Dorothy, Case A's palaeobotanist, this is beginning to change, indicating that it is still somewhat common, though less so than in the past, but points out that this varies based on specific method and disciplinary background.[A66] For instance, Dorothy refers to chemists, geologists and climatologists in the archaeological sciences building who work as if the things they look at are modern and who do not understand why they are employed by the archaeology department.[A66] She appreciates the strong foundations of science, but also recognizes the need for it to be in service of broader ends, such as archaeological research questions.

As with finds analysis, instrumental analyses produce results that are then sent

back to project directors, who use them to stabilize their interpretations and to plan further work.[B11, B12] However, the findings that instrumental methods produce are generally considered more authoritative than the results of finds analysis because they are based on relatively stable and replicable knowledge about natural phenomena, rather than on explicitly situated knowledge predicated on the experiences held by certain authoritative individuals.[A74, A75] However, if one were to look more closely at the processes through which more authoritative knowledge, derived from instrumental methods, is produced, one would discover that these methods entail a series of situated decisions as well. The distance and lack of discursive communication between archaeological projects and the labs where samples are analyzed contributes to an inability or unwillingness to scrutinize the instrumental methods or to question the validity of the results that they produce, whereas the fact that finds analysis occurs during fieldwork seasons and the relative accessibility of the things that they examine (i.e. visible physical properties of objects and their relations to human action, as opposed to the microscopic chemical properties of things far removed from everyday human experiences) encourage greater understanding of the pragmatic experiences of such work, warts and all. In cases where the results are questioned, the fault is usually identified as a sampling error, which situates the issue within the project's domain of influence.[A74, A76] This is similar to Latour and Woolgar's (1986: 129-131) report on how biomedical researchers account for problematic findings, whereby they are reluctant to interrogate "black-boxed" instrumental procedures, and instead focus their attention on factors that lie adjacent to them.

Finally, derivative or synthetic analysis comprises examination of trends based on data generated throughout a project, for instance by tracing the spatial and temporal distribution of finds or samples. This work typically occurs after fieldwork or analysis of finds or samples are complete, and pertains to a targeted scope of analysis.[A77, A78, C15] For instance, Case A was waiting to collect a sufficient amount of materials from across the site before performing a comparative analysis of the distribution of artefact types. However, they did analyze the distribution of materials throughout a single trench that had already been fully excavated; this had yielded a complete set of results derived from finds analysis and instrumental analysis.[A79]

The findings produced through derivative analysis are correlations, associations and trends, which pertain to relationships between entities rather than to archaeological materials themselves.[A77] They are more akin to interpretations than to descriptions in that they explicitly hinge on prior sets of decisions to characterize materials in

certain ways and to compare them with particular methods.[C15] The results of derivative analysis typically do not feed back into a project as functional data; they are not re-integrated into a project's database or used as the functional basis for subsequent analysis. Rather, results are published independently as scholarly journal articles, and inform additional analysis by means of reference to findings produced by prior work.[C16, A80, A81]

5.3.2 Divisions of labour among specialists

In my case studies, specialists participated in archaeological projects at the invitation of project directors, who deemed it necessary to have someone with particular expertise examine certain classes of recovered material.[A82] Certain kinds of materials require more attention than others, depending on how often excavators encounter them and how central they are to knowledge claims. For instance, at Case A, which is focused on a prehistoric site, lithic artefacts are the primary means of investigating past human behaviour due to their sheer abundance, and the fact that questions concerning the patterned exploitation of chert are some of the project's key driving factors. Consequently, Case A has brought in several lithics specialists to examine those materials. Similarly, at Case B, which is fortunate to have recovered undisturbed and easily accessible stratified sequences pertaining to an under-studied period in the region, the project has assembled a team comprised primarily of experts on ceramics derived from that period. Moreover, by virtue of their role initiating the project and drawing up the primary research questions, project directors are also typically very involved in the analysis of these primary sources of evidence.[A26, B13] On the other hand, zooarchaeological analysis is virtually absent in Case A since animal remains are never preserved in the site's highly alkaline soil.[A83] Still, Basil deemed it necessary to identify a faunal specialist as "notionally ... a member of our team" on funding applications to indicate that the project had covered all its bases.[A1] Moreover, a specialization's importance may change as the project progresses, and as the materials recovered on the site changes. For instance, at Case B, where they are beginning to find indoor habitation spaces, including *in-situ* dining assemblages, the directors have plans to bring in palaeoethnobotanists to coordinate more effective botanical sampling and analysis procedures.[B9]

For less central sets of archaeological materials, specialists are often left to work relatively independently. Directors may select and introduce supervisors to lead specific activities, perhaps with assistance from apprenticing students, and leave it up

to these practitioners to do their jobs according to predefined parameters.[A84, A85] While project directors may be relatively hands-off with regards to these delegated activities, they must be mindful of the challenges that the specialists may encounter. Directors must communicate with them to determine what they need to do their work effectively, and support them by providing the resources required to complete their jobs.[A4, A83] Moreover, communication among directors and practitioners of work that is relatively isolated from the rest of the project or work that is mundane and unexciting, helps motivate this labour by highlighting the potential impact and delayed gratification that this work may provide.[A6, A5, A86]

Directors sometimes also turn to senior graduate students to work as specialists on their projects. In these situations, students are granted supervisory responsibility over a set of material, which they may also use for their graduate research.[A87] This provides students with experience working with the material, widely regarded as the best form of training, and also provides them with opportunities to publish their work and get ahead in the academic job market.[A5] In turn, projects gain a dedicated expert who is invested in the project's success, and who will work in an expedited manner to meet their academic deadlines.[A88, A87, A89] Moreover, directors' commitments to support their students provides added motivation to publish their findings as co-authors.[A88] Having graduate student researchers on board also generally makes work more lively and enjoyable for directors and motivates year-round research in spite of hectic teaching and administrative schedules outside periods dedicated for fieldwork.[B14, B15, A90, A91, A92]

Allocating materials and resources for specialist analysis can sometimes lead to interpersonal conflict among specialists. Typically, specialists have privileged access to material that pertains to their areas of expertise.[A88, A93] As Basil put it, it is important "to be more clear up front in terms of this is my expectation of you, what's your expectation, this is yours, this is common, you know?"[A5] He notes that this is particularly important when dealing with relatively junior scholars who are less secure in their academic position and who depend upon publishing as lead authors in order to succeed in their careers.[A88, A93]

There are, however, some exceptions to this. Certain materials or methods are relatively central to the project and multiple specialists may be involved in analyzing them. Since Case B recovers a lot of Hellenistic ceramics, both directors and all graduate students involved are experts in Hellenistic pottery. Rufus intentionally sought

this redundancy as a means to ensure discursive data construction, stating that "we have a site that can make a unique contribution to the Hellenistic period and our understanding of it, and it's better to have ten brains to do that than one".[B16] Similarly, Case A hosts multiple lithics analysts and geoarchaeologists with overlapping experience and skill-sets who frequently discuss and review plans and decisions regarding how to proceed with excavation and sampling the site.[A93, A94, A85, A95, A96] Basil noticed a sense of "paranoia" among specialists, as people anticipate others as "threats" who may infringe on their right to study a particular subset of archaeological material.[A93] He identifies this as especially acute with students and early-career researchers who feel a need to distinguish themselves and carve out their own niche.[A88, B13] Basil considers the prevention and mediation of such disputes as a key aspect of his role as project director.[A5]

At the same time, Rufus stated that "if I had somebody come up to me who was a trench supervisor and say, you know, I'm really interested in this thing, I would foster that interest, they could take that on," while Basil was similarly "looking forward to the moment when somebody turns around and goes 'hey, we're interested in doing this, is this fine? We'd like to give a talk at this conference'".[A92, B1] According to project directors, the onus is on students to make themselves stand out and to claim a component of the archaeological materials for themselves.[A92, B1]

In general, the organizational structure through which specialist analysis occurs, and through which archaeological materials and information flows, imposes a sense of order that helps legitimize the knowledge that specialists produce. The relative independence of specialists from the project, and among specialists working across their own domains, roots the findings within their respective subdisciplinary traditions. In other words, the specialist is a vehicle through which subdisciplinary methods are enacted, so as to equate statements like "our OSL specialist found that ..." and "OSL analysis found that ...". The relative independence of specialist domains and their positions within projects as the sole experts on their subdisciplines, thus contribute to situating specialists as black-boxed tools within the project system. Specialists' work is thus managed as series of operations that take in and put out materials and information. Directors do not need to understand the specific ways in which these operations function, as they are handled by delegated personnel.

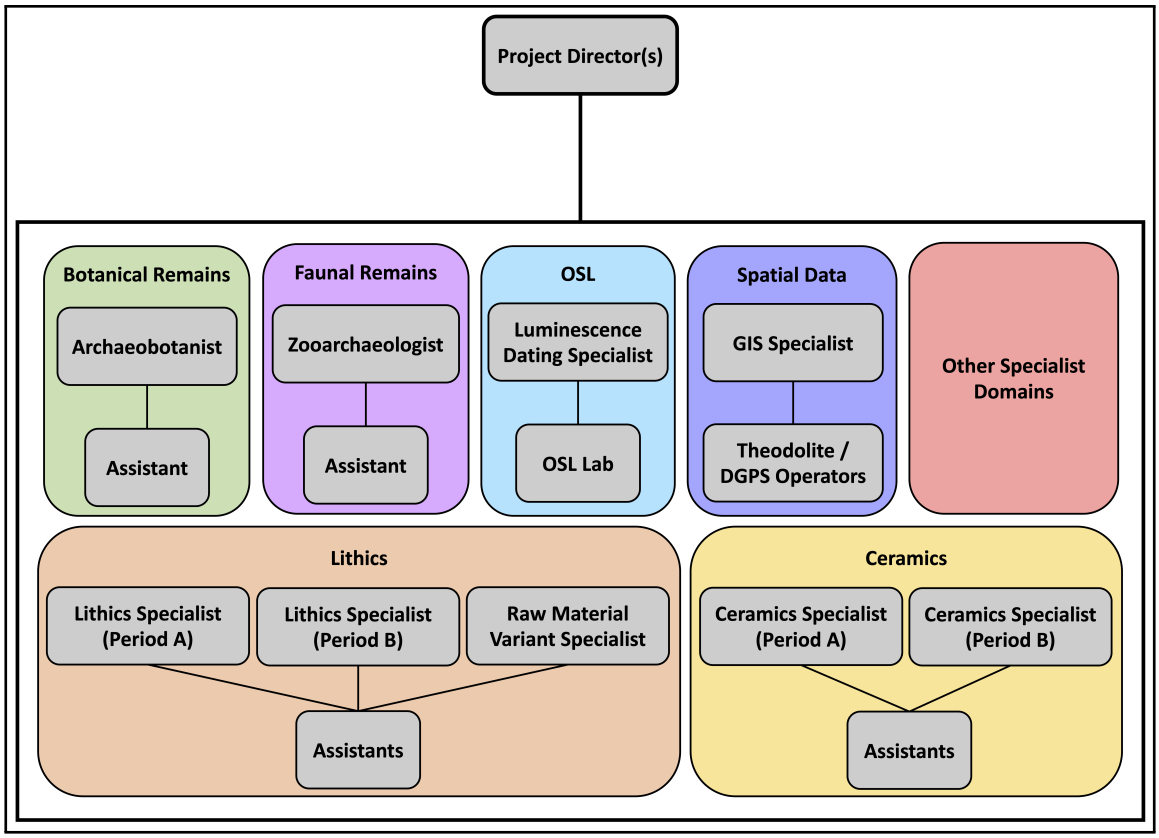


Figure 5.8: Organization chart pertaining to specialist work. Project directors oversee all specialist work. Specialist domains are bounded by the kinds of archaeological materials under their purview.

5.3.3 Integrating specialist findings and perspectives

The division of archaeological materials across specialist domains, as described above, effectively splits a site apart prior to reintegrating the findings derived from distributed analyses. Specialists communicate with others and incorporate their work within a broader apparatus of knowledge production to integrate their findings and make them relevant to the project's overall goals. This section documents how specialists at the cases I examined coordinate their efforts toward this end, and how situating specialized work along standardized workflows and procedures legitimizes the knowledge they produced.

Sampling

Specialist work often involves specific sampling procedures that differ from, but also occur alongside, standard fieldwork practices. Specialists either collect their own samples or instruct fieldworkers to collect samples on their behalf and in ways that correspond to their needs. Trench supervisors are usually present to guide the spe-

cialist in their trench, to help identify the locations from which specimens will likely yield more useful results, and to be aware of changes to their work environments that the sampling procedure may cause. For example, Case A's OSL specialist, who was responsible for establishing absolute dates for various stratigraphic units at the site, was involved with the very careful work of collecting samples from the trenches.[A73] OSL dating determines how long ago mineral grains were exposed to sunlight, and it is critical to avoid exposing specimens to light. Sampling therefore had to occur at night, and the involvement of trench supervisors was crucial for determining where to draw the sample under such cumbersome conditions.[A96] Moreover, it is common practice to place a dosimeter where the sample was taken in order to record background conditions that would have affected that specific location, thus allowing calibration of the dose. Trench supervisors must take care not to disturb these dosimeters as they continue to excavate until they are collected at a later date.[A97]

In some cases, as when a specialist cannot be present during sample removal, it is necessary to delegate sampling work to a fieldworker who has received training in basic sampling procedures. This often happens when a specialist has to leave the field before the end of an excavation season, and takes steps to ensure that work can proceed without them.[A73] When this occurs, that fieldworker effectively works in service of a specialist activity and must consider the criteria that ensure that the analysis can proceed properly. The fieldworker, thus operating as a member of the specialist domain, ensures that the sample meets the quality standards of the subdisciplinary community.

A similar phenomenon was observed at Case B, where Chris is considered an expert in collecting spatial coordinates using the differential global positioning system (DGPS) that forms the basis of their geospatial analyses. Trench supervisors call upon Chris to collect geospatial information from various targeted locations, and he depends on their understanding of the trench and of the value of specific spots that warrant data collection.[B17] He also relies upon trench assistants to help him by holding a portable DGPS "rover" (which communicates with a spatially-calibrated base station located in a fixed position), and talk among them tends to be about ensuring the proper collection of a reliable sample of points (see Figure 5.9).[B18] As illustrated in Excerpt 5.5, Chris records the geospatial point at the position where Oliver, the trench assistant, places the rover, while Liz, the trench supervisor, oversees the process and identifies what needs to be recorded.[B18]

Figure 5.9: Recording DGPS points. The DGPS specialist records the geospatial point at the position where the trench assistant places the rover, while the trench supervisor oversees the process and identifies what needs to be recorded.

Excerpt 5.5. Communicating while collecting spatial data.

Liz: And then if you can just take one point there, and one point right in the middle, umm that's all we need.
Oliver: Ok.
Liz: And then you're free to start digging and I'll help you out in a minute.
...
Chris: So what are we doing?
Oliver: We're taking points.
Liz: Just one where you dug.
Oliver: Here?
Liz: Yep, yep. One in there, and then one over there is fine, somewhere in the middle.
...
Chris: It's excavation unit [redacted identifier]?
Liz: Yeah. Closing.
Chris: Alright.[B18]

Integrating data and findings

After performing their work, specialists report back to the project with their findings. This involves providing the project with documents that contain and explain the analytical results. These documents typically comprise electronic spreadsheets and typeset documents, but may also include lab journals, paper recording sheets, source code, and digital images. These media vary in their functional roles and value.

For instance, the spreadsheets that archaeological specialists produce in the cases I examined are the formally organized results of systematic analysis. They are organized on a sample-by-sample basis, associated with discrete units from which each sample element was taken (see Figure 5.10).[A6, A98] These records are analytical results in that they are the products of analytical processes, but they are also data in the sense that they are considered to be grounded and stable records of systematic observation that may serve as a sound basis for further investigation.

Specialist reports, on the other hand, are summaries of a specialist's findings. They describe overall trends that specialists observed in their preliminary analysis of the findings, highlight their potential significance, and propose ways to ameliorate

A

	DATE TAKEN	SAMPLE	TRENCH	LU	CONTEXT	SECTION	Description of LU	Local Datum	LOCATION (X,Y,Z)	DOSIMETER (Y/N)	Dosimeter Collected	Reasoning	LAB
2	03-Jul-17	17 - 01		LU2	, (in particular)	North	Sand	LD.043		Y			
3	03-Jul-17	17 - 02		LU3	, (lowest context sampled)	South	Sandy Clay	LD.043		Y		How do these layers correlate to)	
4	Was not extracted, to many rocks	17 - 03		LU3		South	Sandy clay, gleysolic			N		Sample not taken because too many lithics, where	
5	03-Jul-17	17 - 04		LU7A		North	Carbonate layer above weathered bedrock			Y			
6	03-Jul-17	17 - 05		LU 6		North	Clay layer			Y			
7	03-Jul-17	17 - 06		LU7		North	Red palaeosol where shells preserved			Y			
8	03-Jul-17	17 - 07		LU6		North	Calcareous sand layer			Y			
9													
10	04-Jul-17	N/A (JF lab)	Aeolianite	Aeolianite	Previous Str. 1	Exp. 1B	Pristine aeolianite			Y		Change in interpretation of aeolianite - from stratigraphy to different phases of weathering	

B

	Context No.																					
2	Flot No.	4	117	51	57	103	105	106	125	150	153	47	26	64	68	54	145	173	107	148	159	162	158
3	LU	4	5	5	5	6	6	6	6	7	6	???	2 to 3	2	3	???	2	3	1	???	???	???	2
4	Deposit	truncated palaeosol	aeolian sand	calcium carbonate	calcium carbonate	aeolian sand	aeolian sand	aeolian sand	aeolian sand	palaeosol	aeolian sand		hearth	colluvium	aeolian sand		colluvium	colluvium	topsoil				colluvium?
5	Comments		poss. contam. 1st unit of season										2nd spit of hearth material	remnant silver over hearth	right under hearth		likely mixed (obsid./Mes	oked (obsid./Mes	pointless sample				???
6																							
7	Barley grain sp.																						
8	Cereal indeterminate												2	1				2		1			
9	Lentil sp.														1								
10	Vicia/Lathyrus																					3	
11	Pulse indeterminate			1							4	1	6								3		
12	Einkorn glume base															1							
13	Grape (frag)	4																					
14	Nut shell (frag)					1																	
15	Hordeum marinum																2						
16	Malva sp.																						2
17	Polygonum sp.																2		2				
18	Cyperaceae sp.																2		7				
19	Lithospermum sp.				1																		
20	Boraginaceae sp.					1	6	4	21	3													
21	Weed indeterminate		1																				2

Figure 5.10: Screenshots of spreadsheets maintained by archaeological specialists. A depicts a spreadsheet maintained by Marie, Case A's OSL specialist. B depicts a spreadsheet maintained by Dorothy, Case A's archaeobotanist.

the results or relate them to other aspects of the project.[B11] In other words, specialist reports contextualize the analysis and relate the findings to the project's general research objectives. They present conclusions that align or conflict with alternative perspectives, settle or give greater confidence to particular claims, and suggest aspects of work that warrant further attention. They do these things in an embodied manner, and in a way that reflects the pragmatic situation of their work; they serve to contextualize the data presented in spreadsheets, which lack any such capability on their own.

Specialist datasets are integrated into a project's relational database by importing the relevant records as their own sets of tables, with explicit links drawn between them and the database backbone, which reflects the organizational structure of archaeological entities encountered in the field (see Figure 5.10).[A98] For example, samples that are drawn from a particular excavation unit are listed in a specialist table, but are linked to an overarching index of all excavation units.[A6] Analytical results can therefore be retrieved for particular parts of a site, alongside findings derived from different kinds of analysis performed on material deriving from the same contexts.

The material that is physically distributed and sent out for specialized analysis is thus conceptually re-integrated in informational terms. Diverse kinds of material are rarely examined in close physical proximity outside of fieldwork, though the potential to integrate abstract measurements about them is highly valued.[B19, C17, C18, C19] However, this actually rarely happens in ways that leverage the computational potential of these efforts. Specialists provide their own preliminary analyses in written and oral reports, in which they examine the materials under their own purview.[B1, B11] Analysis is thus usually siloed, and findings derived from these analyses are subsequently integrated.[A99, A89, B12] If the goal of having specialists involved in a project is to obtain a report of findings obtained through the application of rigorous and systematic methods, then specialists are black boxes through which processing mutable materials may yield confident results. It may be necessary to peek inside the black box to confirm that the mechanism is functioning in accordance with quality expectations, but this does not generally require in-depth understanding of the methods; it requires a generalist perspective, which is a quality characteristic of those in charge of *managing* archaeological projects.

Coordinating and aligning perspectives

Working as an archaeological specialist involves a tension between working in isolation and as part of a team. By definition, a specialist is someone who has a unique perspective for a project that lacks a particular point of view. Specialists' interests may overlap with those of other members of the project but, for the sake of efficiency, directors typically prefer to have one specialist for each means of investigation. One exception to this is that specialists working on key materials with somewhat different approaches may have received training within the same general frameworks. This facilitates communication among them. For example, the geoarchaeologists at Case A share a strong affinity based on their mutual work with geological materials, despite the fact that they specialize in different geological processes.[A85, A95] This benefitted the project immensely, since it allowed each specialist to reflect upon the limitations of their approach and to harmonize that approach with those of others.

At the same time, however, the value of these complementary perspectives has yet to be demonstrated when presenting findings to the research community. Much of the discussion among geoarchaeologists at Case A, for instance, concerned strategic planning, including planning where to excavate, prioritizing where to take samples, and considering the degree of confidence that should be placed in certain findings. In other words, these are process-oriented discussions that reflect upon decision-making processes. Generally speaking, this information is not effectively represented in archaeological databases and in archaeological reports, which are more oriented towards articulating research outputs in a clear and confident manner. Inputting analytical findings into a database is a lossy process that fails to capture much of the pragmatic knowledge and critical reflection provided by individuals and collectives.

5.4 Archaeological data management

Data management comprises combined efforts to assemble, organize and curate the information created by and of concern to archaeologists. In general, data management is concerned with fulfilling a series of core goals:

- Maintaining a centralized and up-to-date repository of all data that the project generates.
- Creating and maintaining consistent data structures that express parity and integrity within and across datasets.

- Maintaining persistent metadata, particularly metadata pertaining to archaeological provenance.
- Adhering to methodological standards or institutional priorities adopted by the project.
- Organizing, preparing, and synchronizing the flow of archaeological materials and records.
- Curating data with a focus on maintaining their value and supporting their future use.

In other words, data management is about developing and using infrastructures, or ways of relating individual instantiations as complementary parts of a common entity (Bowker et al. 2010: 101). Infrastructures are both technical and conceptual in nature. It is necessary to engineer practical systems for recording, storing, organizing and retrieving information in ways that conform to an overarching conceptual model of information flows and relationships. This involves reconciling the relatively abstract processes that the model characterizes with the pragmatic needs of end-users who must engage with the system's real-world implementation.

Though this would be impractical in contemporary contexts given the alternative circumstances under which archaeology occurs, archaeological data management *can* be done without the use of digital systems, as was the case throughout the discipline's pre-digital history. Archaeologists have been recording and organizing data using paper-based information management systems for many decades, including punched card systems, ledgers, index cards and paper tags (cf. Gardin 1958; Cowgill 1967). Digital information management systems are rarely contextualized in relation to the immense experience that archaeologists have accumulated in developing ways to store, organize and retrieve complex and voluminous sets of information at scale, using both digital and non-digital means.

This section describes work involved in database management, the roles of the people who perform this work, and the key values and commitments that underlie this domain of work, at the cases I examined.

5.4.1 Technical work

In general terms, an archaeological data manager is someone whose work is primarily concerned with developing and maintaining systems that project members use to as-

semble, organize and retrieve archaeological information. In this role, data managers help schematize the production of archaeological data and serve as liaisons between other project participants and the technical system itself. As we shall see, this role involves holding a particular mindset and a specialized set of technical skills that together grant the ability to fulfill the needs of archaeological projects through digital means.

The people who do this work in the three archaeological projects investigated in thus study are usually tech-savvy individuals. They work in service of archaeological projects – rarely as creative leads, and as consultants who are trusted to do highly specialized tasks using skills that are not commonly held by others in the field. They often see themselves as fulfilling this role as a favour to the project leaders by volunteering their unique and widely sought-after technical skillsets.[A100, C20] They frequently identify as non-archaeologists whom project leaders call in to support archaeological research, and are often spouses, old friends or personal associates of these project leaders.[A100, B20, C21, A101, C22, C23]

Most technical workers with whom I spoke have worked outside of archaeology, in some applied or non-academic field, at some point prior to their involvement in archaeology. Amelie, Leonard, Greg, Paul and Ned, all of whom maintain archaeological databases for the cases I observed, have either formally studied computer science or worked in private industry applying information technology skills.[B21, C24, C25, C26] Others, such as Rufus, Liz and Jamie (one of Case A's database managers), acquired technical proficiency through formal training and through application in their research, which sets them apart from other archaeologists who have followed standard curricula.[A102, B22] Only Barry and Susan, who are key figures in Case C's operations, stand apart as traditionally trained archaeologists who also fulfill technical roles.[C4] Despite the common association between digital savviness and generational differences, a point that study participants, particularly younger participants, parrotted,[C27, C20] many of the technical workers with whom I spoke are older, and many younger individuals expressed ignorance, ambivalence and even fear of computers.[A103, A104, A105]

One crucial factor that sets all of these people apart from ordinary archaeologists is their keen interest in experimenting with computer systems in a way that exposes them to computers' inner workings, and which go beyond relatively superficial uses of computers, such as browsing the web, gaming, and word processing. These engage-

ments involve exploring another world in the machines with which they tinker, and they are governed by a particular kind of logic. Many technical participants attribute their comfort with using computers to early experimentation at a young age. Barry recalls how he has "always been around computers," and that he has "always been sort of hot wiring stuff" to customize his childhood computer setup.[C28] In an unrecorded conversation, Greg similarly attributed his analytical and problem-solving skills to time spent playing around with computers as a young kid.

People who are more adept with creative use of computers share a unique mindset in that they tend to take seriously the need for formal and concrete representations that are more amenable for computation. They understand how computers "think," they can foresee how computers will react to certain kinds of inputs, and they can consider the pragmatic challenges and possibilities that various computer applications may yield. Given technical ability (which is separate from, but relies upon a technical mindset), they are able strategically to design and implement workflows that depend on particular computer applications to achieve desired goals.[B23] In other words, they consider what computational steps are necessary to get from point A to point B, and transform data in ways that satisfy the unique demands of each step.

But, as specialist operators of these tools, and through their understanding of what computers need to function properly, data managers are established as key liaisons between those who work in relatively unstructured ways and the computer systems that require more formal inputs. For instance, Greg identifies his role as database manager as "giving the data to the decision makers, getting this data easily accessible to Rufus so he can go in, find patterns".[B24] Similarly, Jamie indicates that "ultimately the main concern is, you know, what they give us, what they need from us".[A84]

In a rather abstract sense, their role is to help translate meanings created by their colleagues into digital representations that are more amenable to computation. Data managers are also responsible for ensuring that the computational processes performed produce outputs that meet the expectations and standards that colleagues deem acceptable, while ensuring that results remain true to the original meanings applied by the information's creators.

5.4.2 Technical agency

As interlocutors between archaeologists and computers, data managers' role is to serve as technical components within a workflow. Data managers often see themselves as being treated as a tool or a service, operating as cogs in a mechanism.[B24, A106, C29] Moreover, these workers tend to be singular in their role, with experience in using digital tools unmatched by others in the project.[C26, C30] This and other factors (including their distinct work environments, distinct communities of practice in which they participate, etc.) contribute to recognition of differences and the establishment of community boundaries. These boundaries are sometimes articulated in terms of a project's life-cycle, drawing hard distinctions between visceral phases of data collection and subsequent abstract phases of data analysis.[A5]

This dichotomy is articulated from both perspectives. Amelie, who develops and maintains archaeological databases for many of Case C's member projects, remarks how her role is limited while projects are "still very much in the data collection phase,"[C31] and Jamie is "always try[ing] to keep in mind how we're going to be analyzing this data after."[A84] Meanwhile, some fieldworkers acknowledge that their work serves a longer, drawn-out process whereby project members infer meanings through aggregate analysis down the line, during a separate phase of work.[A107]Others find meaning in the things that they recover day-to-day, and distinguish this excitement from direct engagement with archaeological finds from the meaning derived from synthetic analysis at distance from the field.[A56]

Despite the recognition of difference, archaeological data management generally lacks its own cohesive identity as an archaeological sub-field. Archaeologists who find themselves in this line of work tend to operate in similar ways or deal with certain common challenges, due to systemic factors that affect archaeology in general,[C26, A108] however the work itself is generally improvised and reactive to specific situations that they are called on to resolve. This is actually deemed a valuable attribute, since it ensures that technical work serves an archaeological purpose rather than being performed for the sake of demonstrating flashy technology.[B25, C4]

However, the isolation of data management work means that technical workers rarely communicate their methods or processes to others within the project.[C32, C33] The communication channels they do maintain often reinforce the service orientation of their work.[A109, C34, C32] For instance, technical workers are periodically in contact with project directors in order to coordinate work; a project director may attach a

spreadsheet and ask that the data contained within it be integrated with the rest of the system, or may request information to be retrieved from the database according to stated objectives (see Figures Figure 5.11 and Figure 5.12). The database manager independently determines the best course of action to fulfill the project director's expectations.[B24] This form of communication is explicitly reminiscent of delegating work to a black-boxed digital mechanism or workflow (as was discussed in Section 2.2). In some cases, the database manager may request additional information to make the integration work, from either the director or from the person who generated the spreadsheet, but this often shields the reasons why such information is needed: there is an understanding that opening the black box and explaining it and its limits, despite this being the reason for requesting additional information, is not a worthwhile pursuit, since directors are really only interested in obtaining a functional product.[C35]

Technical workers may write checklists as a means of planning how to implement the work, or for documenting a task that they think will have to be repeated later or in alternative situations. I did not observe anyone prepare a formal data dictionary (as described by Banning (2020: 54)), nor did any participants report that they had done so. These are forms of communication with oneself, or with one's future self. They may also write technical reports that document how a functional system is put together, and the work performed to make it work. These may serve to communicate the intent and general layout of a system for future systems administrators who may be confused about why things were done the way they are.[A109] It is a form of self-audit, and can help the technical worker reflect upon the opportunities and challenges that their cumulative decisions afford.

5.5 External participants

Archaeological projects do not operate in isolation. They are part of broader systems of knowledge production. This section identifies roles and institutions that exist outside individual archaeological projects, but that play significant roles in shaping archaeological work and disciplinary identities at the cases I examined for this study.

5.5.1 Archaeological communities

Archaeologists often express a sense of ambiguity when defining their positions in relation to broader social and epistemic communities, whose internal and external boundaries are unfixed. Rather than situating oneself in relation to hard bound-

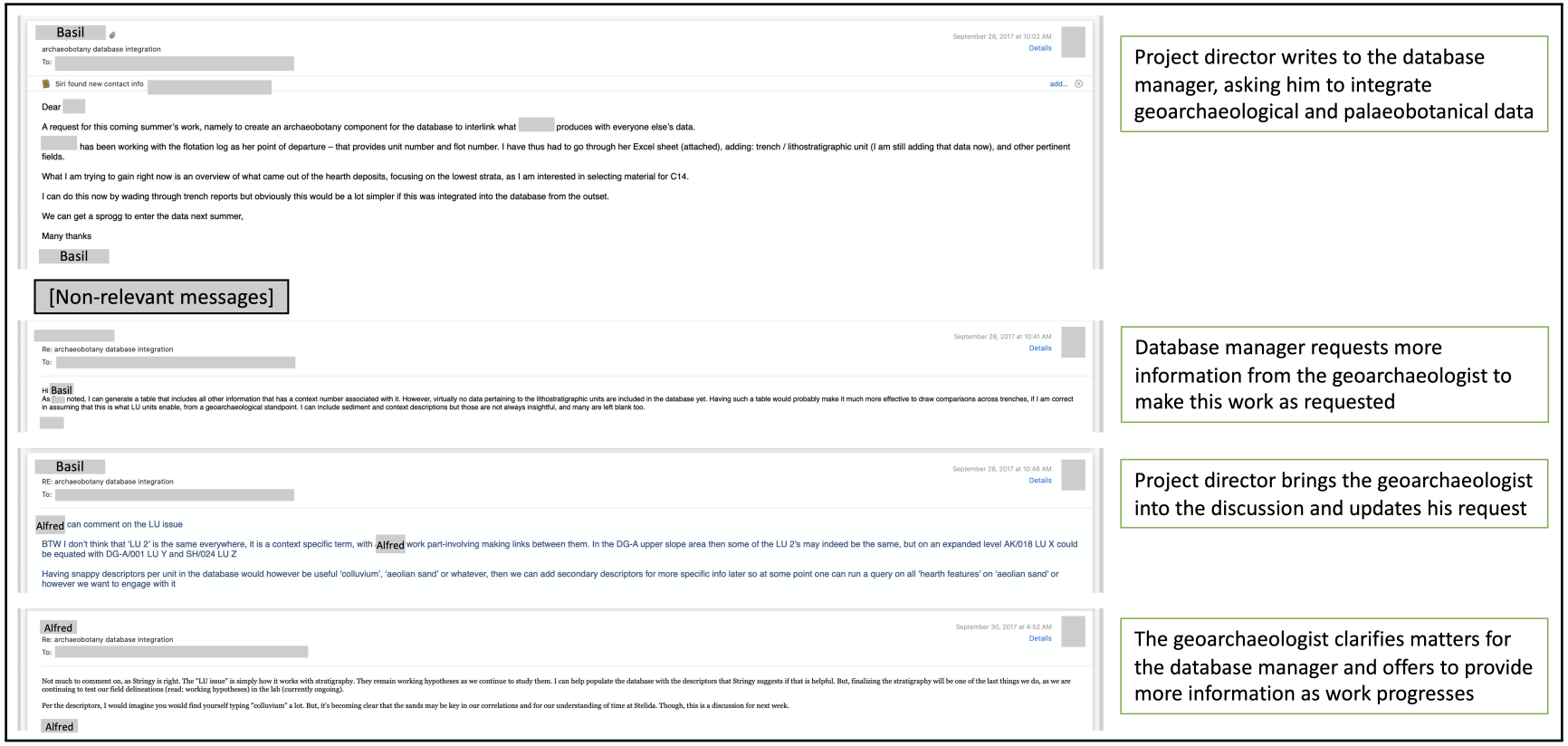


Figure 5.11: Email exchange requesting information to be integrated into the project database.

Figure 5.12: Email exchange requesting information to be retrieved from the project database.

aries that demarcate sub-sections of the field, in the cases I examined, it was more common for archaeologists to refer to their participation within particular activity systems or communities of practice to establish their disciplinary identities (cf. Carman 2018).[A110, B26, A111] In this sense, one's involvement with the archaeological community is subject to change as one develops new skills and experiences that inform new kinds of interactions.

Archaeological projects are collectives that centre around a particular site or topic of mutual concern, but at the same time contribute to broader efforts to understand archaeological phenomena in more general ways. A project may relate with other work occurring in the same region, or on the basis of similar methodological or theoretical approaches.[B27, B28, B29, A112, A113, C36, C7, C37] The "small world" of archaeology is made up of favours, cross-appointments, resource-sharing, and storytelling, much of which occurs in liminal fieldwork settings (Morgan and Eddisford 2015). For instance, Case A and Case B shared work space and tools with other projects in their respective museum work settings, and would sometimes take breaks or gossip together.[A114, B30] Moreover, Basil described how a prominent palaeobotanist had "given us her PhD student, Dorothy", and numerous other specialists and trench supervisors described how they got involved in their projects through professional recommendations among colleagues.[A73] Archaeologists also use social media and the time between conference sessions as venues for community building, where archaeologists get to know each other as people with rich personal and professional identities that precede their published work.[C38, A90, A115]

These relatively casual engagements are supplemented by more formal interactions, for instance through presenting at conference sessions or publishing in journals on topics of mutual interest. When presenting research findings, archaeologists imagine a community as the prospective audience, with its own norms and standards, and do their best to account for the potential challenges that they imagine that audience might express.[B26, A116, A117] In other words, archaeologists presenting their work as a legitimate contribution to archaeological knowledge try to align their efforts with the epistemic and professional expectations that they imagine the community holds, and which they, as members of the community, share with them and understand as valid epistemic standards. Archaeologists exist as part of, while simultaneously distinguishing themselves from, broader social and epistemic systems.

5.5.2 Consultants

More active interactions between archaeologists and external members of their research communities also occur through consultation with key figures, whom they call in to provide informed insights as a prelude to broader dissemination of a project's findings or to provide expert opinions on how work should proceed. Consultants are specialists in their own right, but their involvement is usually limited to one-off interactions that preclude long-term commitment to the project.

Consultants may be called in to examine peculiar or anomalous material configurations that confound project participants. For instance, as illustrated in Excerpt 5.6, Basil asked Andreas, a micromorphology specialist, to perform a preliminary, *ad-hoc* examination of the microstratigraphy in a trench that exhibited evidence of hearth activity:[A118, A119, A120, A121]

Excerpt 5.6. A consultant provides guidance on how to collect meaningful information.

Andreas:	And on this side, on this side, is the, the fire base, sand, sand right below the, the hearth. ... This sand is de-calcified, which again implies kind of, [left on] the surface in order to de-calcify. And on this surface, the guys came and put fire. Actually the matrix of the black stuff is sand again. ... So the whole thing is kind of in play but not in sequence. ... Of course we don't see any more ashes because they have been dissolved away. Actually what you see under the microscope is just sand grains surrounded by [unclear] made of very fine charcoaled dust, dust charcoal. That's why you don't find, I guess, charcoal inside, probably [a] few bits.
Basil:	Yeah, it's nothing. Yeah it's a very very tiny amount.
Andreas:	Yeah, I mean okay, it's like putting a fire down on the sand. You know, the sand is something that moves, always, around. Even people when we're trampling it, you know animals, you know .... Sadly, nothing would survive, ... so much not in a ... but would end up in dust, something like that.
Alfred:	Oh well.
Andreas:	But still, it's [held up] in place, and made on the, on the material that is just below. So they are, let's say, kind of the same, umm, story.

Basil: Excellent.
Alfred: That's good. Yeah.
Andreas: I mean you can date, . . . The accumulation of the sand below and the fireplaces on top, they might be about the same age, more or less. I mean, if you are lucky and you . . . you can separate these two events, it would be nice but I think it's, it wouldn't be very...
Alfred: [unclear, but something about carbonized remains]
Basil: We have a few carbonized remains. And we, we just took another 167 litres of flotation so our, we have our archaeobotanist coming through next week.
Andreas: Yeah, then of course. . . . It is, there's no doubt about it.
Alfred: Yeah.
Andreas: Actually yeah, ok I forgot. There's quite a few burnt bone inside but are reduced in the size of sand. Let's say less than a half a millimetre, but they are burnt. Again, because you know, they are so [can't hear because of the sieve nearby], they've degraded in that small sizes.
Basil: Well, that's the only bone we have from the site so far.
Andreas: I can show you under the mic, I mean they are tiny like . . . sand grains. And they are burned too.
Basil: I wonder if we could do anything further with that.
Andreas: Other than dating, I don't think, what else? Yeah. Yeah, I think more or less, you can't do more.
Basil: So what–
Andreas: Ahh, I mean, ok, in theory, some more fancy biochemical analysis? I don't know, I don't know if these things have survided. But why not? There have been, lately, some umm biochemical analyses on these kinds of stuff.[A121]

In this exchange, Andreas remarks that there is enormous potential to apply more in-depth micromorphological and instrumental analyses in this particular trench. He provides guidance on how to expand excavation around this trench on the basis of his understanding of the geological processes at work on the site and how they would affect the archaeological traces of hearths, and suggests new forms of analysis that the director had not yet considered. Each participant plays a particular role here: Andreas provides his brief analysis as a visiting and non-committed specialist; Alfred, who is the project's dedicated micromorphology specialist, recalls specific

aspects that can be leveraged to support his own investigations; and Basil uses his authority as project director to decide that these ideas are worth pursuing in greater depth.[A120, A121]

Similarly, since Case B does not employ a full-time zooarchaeologist, Chris occasionally sends pictures of faunal remains they recover to a colleague who can quickly identify them. In one case, Chris was fairly confident that a long bone they found was a cow's femur but he wanted to verify that it was not a human bone, which would have called for very different excavation procedures and project management decisions.[B31]

Alternatively, projects sometimes seek to leverage their authority on a subject to bolster confidence in cases when their findings rest on shaky foundations or may be controversial when published.[A122, A123, A124] This is exemplified by the way that Case A handled its anxieties regarding the extremely colluvial nature of the site. Colluviation complicates any effort to date stratigraphic units and had resulted in many artefacts having extremely weathered surfaces that make them more difficult to characterize. Despite his confidence in their claims due to his daily involvement examining these artefacts, and his acknowledgement that the stratigraphy is imperfect, Basil knew that he would have a hard time convincing others of the nature of the things that they found. He therefore involved Denise, a major figure in lithics analysis who was responsible for publishing the most definitive assemblages of the kind of materials recovered at Case A, to examine their materials, as articulated in Excerpt 5.7:[A124, A125]

Excerpt 5.7. Basil explains his rationale for inviting a consultant to examine the archaeological material.

> Basil: ...for decades, there have been accepted means of scientifically representing the archaeological record, umm to act as evidential bases for your claims. It's understood, that you know, it's impractical for every single interested archaeologist to come to see your site, to see your material. You could be in Australia and the site could be in Peru, umm and so, without that tactile, immediate relationship with the evidence basis that somebody's uhh excavated, there are ways of representing it through photography and line illustration. Umm, that always used to seem to be enough, but it seems like again, it comes down to this contentious nature of our site. The fact that we

> are, we allegedly have such an early site where such early sites are not meant to be, I'm starting to discover that some of what used to be the accepted means of, accepted ehh evidential umm bases, don't seem to be good enough for everyone. And so it's been very important to have people like Denise come and see this stuff in the flesh. Yes, she's seen the drawing, yes, she's seen the photograph, but for her to see it first hand, handle it, pick it up, query it, umm look at, look at assemblages, as opposed to cherry picked illustrated pieces, has been fundamental to convince her that we really have what we say we have.[A124]

At the same time, Denise informed Basil about some of her concerns with the material, and in Excerpt 5.8 Basil recalls how this constructive criticism provided him with an understanding of how to proceed to accommodate these issues.[A125, A126]

Excerpt 5.8. Basil explains the feedback he received from a consultant, and what this means for future work.

> Basil: So the superstar material that Lauren was excavating, that we thought was Levallois blade cores, she disagreed. She thinks the material is fabulous, she's never seen this material before in Greece, she thinks it's Aurignation and looks much more like what you would find in France. She's blown away. She's blown away by–
>
> Zack: But it's still Middle Pal?
>
> Basil: Very early Middle Pal. But, we had shown her our superstar pieces. This is where it–
>
> Zack: I was in the trench that first day when we, and I was like cores, wow, tons of them.
>
> Basil: I mean that stuff is– but we had shown her some of our superstar pieces from the survey, like here's a Levallois point, classic thing. But she's like hmm, it's just one piece. Haha you know, it's just like, A, she's not exactly ship's been gone, but she has very high standards.
>
> Zack: So is she sticking with, is she saying that M. Pal was a thing though?
>
> Basil: She was like, so she was looking at these, these little bits and pieces, and like, well, the stuff, you know, we showed her a whole bunch of stuff, it's like, we think this is Levallois, she's like no, it's this. And

> then we show her some stuff from the survey and it's like, hmm it's one piece and it could be, but it's just one piece, that's not really enough. And then finally we showed her the material, Jolene showed her material from [trench], Alice's new trench, and she's like yes, this is Middle Palaeolithic.[A125]

From these examples we see that members of the archaeological community who are not active project participants sometimes supplement the input provided by specialist project participants. As people who are external to the project, they are not committed to following through on their advice. They instead relay their interpretations to specialists who are already members of the project and who are capable of implementing their guidance.[A127, A128]

5.5.3 Scholarly institutions and infrastructures

Another class of individuals who are not part of projects but play a significant role in their development includes individuals and institutions that support and sustain projects and the information they produce. Funding agencies, universities and research institutes provide monetary, logistical, and administrative support, as well as institutional legitimacy, that enable archaeological work to occur. Universities are also sources from which archaeological projects recruit skilled, yet also cheap, labour in the form of student fieldworkers and research assistants.[A38, C39, A39] In the cases I examined, universities also served as venues for professional development by providing resources for drafting optimal grant applications, and by mandating and enforcing adherence to research ethics protocols. Regional and disciplinary professional organizations provide additional institutional legitimacy, which develop initiatives, policies and statements that support and protect the concerns and interests of their members.

The archaeological projects I investigated also engage with academic journals, data repositories, and other elements within the scholarly publishing ecosystem. Manuscripts submitted to journals are peer-reviewed, meaning that they are vetted by other archaeologists who are tasked with validating the soundness of the methods and claims that authors present. Moreover, journals and the editorial boards that manage them maintain and perpetuate common writing practices and tendencies, such as norms regarding how to organize a paper and how to recognize and allocate credit to the various individuals involved in archaeological knowledge production.[B32, A129, C40] Journals increasingly require that authors make their data openly available, and

record and distribute scholarly metadata associated with each paper, including information about how the work was funded and the affiliations of the authors.[A129] The widespread adoption of digital object identifiers and their popular association with the act of citation has also contributed to changing attitudes regarding what constitutes a legitimate contribution to science (namely, the association between a citable object and legitimate contribution, the associations and distinctions between scholarly infrastructure and the ideas being presented through them, the challenges of contextualizing citations, etc).

5.5.4 Non-archaeologists and the general public

The archaeologists I spoke with often engage with non-archaeologists as part of their work. The degree of discursive interaction varies, but is generally limited, at least in relation to how archaeologists talk among themselves. Recognizing differences between archaeologists and non-archaeologists involves sensing the mindsets held by the other parties and catering to their expectations of what archaeology is.

For instance, George described his work with environmental scientists, who rely on archaeological data to help produce hyper-granular palaeoenvironmental reconstructions, which will also support archaeologists' capabilities to understand past environmental conditions.[C41] More specifically, he described how archaeologists are working to make their data available for these purposes, without fully understanding how they will be used once they hand them over to the environmental scientists.[C41] George also described his collaborations with computer scientists, who are using archaeological data to develop shape recognition software, which will help archaeologists automate pottery classifications in the future.[C42] He described the lack of communication with the computer scientists as slightly concerning, but understands that this is a worthwhile partnership, regardless.[C42] In these examples, cooperating parties stand to benefit from the outcomes of these partnerships. However, each party remains somewhat distant with respect to their research processes.

This is an interesting role-reversal with regards to archaeology's magpie attitude towards the application of new methods; archaeologists frequently adopt tools, methods and theoretical outlooks from other disciplines in order to derive new meanings from the things they recover, while members of these disciplines are indifferent, or even unaware, of archaeology's use cases (Caraher 2022: 377-327; Nilsson Stutz 2018: 51). In these cases, however, archaeological data and epistemic processes are being

used by others to meet their own ends, and archaeologists are relatively indifferent towards how their work is being applied.

This ambivalence regarding how members of other scientific disciplines view archaeology is matched by an general desire to publish in non-archaeological journals, particularly journals with a strong historical legacy, such as *Science* and *Nature*, that have a broad readership in the fields of science, technology, engineering, and mathematics (Nilsson Stutz 2018: 51-52). While publishing in these journals is generally considered a boon for one's career, there is growing frustration among archaeologists (and social scientists and humanists in related fields) regarding the quality of archaeological work they publish.[A116] In particular, there is a sense that these mega-journals publish work that misrepresents what archaeology is. Work that is ostensibly on archaeological topics and that should involve archaeologists' input often does not involve archaeologists at all. This is particularly poignant in papers about ancient population dynamics or cliometric analyses of ancient societies, which draw from very rudimentary or flawed understanding of human culture and its study (cf. Madgwick et al. 2021; Turchin et al. 2022). Papers published in these journals often attract the attention of mainstream media outlets, which repeat the faulty reasoning and perpetuate misconceptions of what archaeology is among the general public, which already holds flawed and misleading views on archaeology. A significant difference between these scenarios is that, in the former cases, archaeologists are actively involved as collaborators, whereas in the latter cases, archaeologists are left out of the work that they feel misrepresents their own perspectives.

5.6 Summary

This chapter frames archaeological projects and the communities involved in archaeological knowledge production as social worlds, which I described by highlighting the characteristic tools, methods, attitudes, and values associated with each domain at my three cases. It also articulates the distribution of labour across project systems by specifying the roles and responsibilities assigned to individual members and sub-collectives. The social structures that govern archaeological projects effectively influence how practices are enacted and information is produced. Identifying the professional norms and expectations pertaining to each domain of work is necessary for understanding the factors and value regimes that circumscribe and motivate work. This in turn allows the information systems that support productive and collective

work to account for and challenge those factors.

5.6.1 Overview of social worlds

Project management is the domain responsible for establishing the archaeological project as a sociotechnical system. These systems serve to legitimize the knowledge that archaeological projects produce by directing the flow of information among team members who bear different degrees of authority to ascribe meaning to archaeological objects and phenomena.

Fieldwork is a social world primarily associated with collecting and recording archaeological objects and phenomena in relatively uncontrolled settings. Fieldworkers are responsible for drawing materials into systems of archaeological knowledge production. While this does involve active meaning-making, the fieldworkers I spoke with downplayed the creative aspects of their roles and preferred to think of their work as operationalized labour in service of plans developed by project managers and specialists.

Specialist work is characterized by the authority to ascribe comprehensive meaning to archaeological objects and phenomena. Specialists implement tools and methods to articulate projects' material assemblages according to broader conceptual models to facilitate comparison. However, within the projects I observed, specialists tend to work in relative isolation, and rarely relate their experiences with specialists from other fields.

Database management is responsible for formally articulating information derived from multiple sources within archaeological projects and rendering them in ways that facilitate their retrieval and analysis. Database managers operate as supportive agents who mediate between other archaeologists and the digital environments in which data are stored, processed and analyzed.

I also describe a series of additional roles and responsibilities that relate to archaeological projects but are not necessarily part of them. Archaeologists identify as members of research communities centred on common interests, which serve as venues for competition, evaluation, and legitimization, and as arenas for discourse on topics of mutual concern. Consultants are specialists who are formally unaffiliated with a project system, but are called in to provide their input on peculiar or anomalous materials, thereby acting as informal liaisons between the project and the

research communities they represent. Scholarly institutions and infrastructures provide financial, logistical, and administrative support, and serve to legitimize archaeological work as meaningful contributions to worldwide collective knowledge bases. Finally, non-archaeologists and the general public are people and communities who derive alternative meaning from archaeological findings that correspond with their own worldviews and use cases.

Each archaeological project operates in unique ways, and organizational structures may vary depending on the different circumstances that challenge work or open up new opportunities. Moreover, archaeology varies on a regional basis, in relation to the kinds of materials recovered, and according to different schools of thought and methodological traditions. My intention is not to draw up a definitive set of social worlds that occur in all archaeological projects. Instead, I aim to articulate the distinct roles and responsibilities in the cases I observed, in support of my continued analysis in Chapter 6, which identifies day-to-day discursive negotiations and tensions among these domains.

While the cases I rely on exhibit certain consistent qualities, they also have their own unique character. Consequently, the evidence that supports my characterization of these domains is not evenly distributed across my cases. As I described in Section 4.2.1, I spent much more time at Case A than the others and I am therefore more familiar with how that project operates. I was able to observe how Case A changed over time, how management decisions were made and how the team responded to key decisions, and Case A is therefore more fully represented in my characterization of the project management domain in Section 5.1. Similarly, I was able to observe specialist work at Case A to a greater extent than at the other cases, which affects the distribution of evidence in Section 5.3. Moreover, I did not observe any fieldwork pertaining to Case C, and evidence from this case is mostly absent in Section 5.2.

5.6.2 Social worlds and collaborative commitments

The social worlds I identified in my cases, which I discussed throughout this chapter, do not have definitive boundaries. Rather, they are differentiated by their roles within broader systems of archaeological knowledge production. I derive their unique character from the circumstances and challenges that they must deal with, and the tools, attitudes, and expectations that they rely on to operate effectively in those environments and cooperate within knowledge production systems. As such, people

flow into and out of social worlds depending on the objectives that they are tasked with achieving and the circumstances that frame their operations. This is perhaps best illustrated by Ben, who, after becoming a trench supervisor upon returning to Case A during his second year, was forced to perform new "paperwork" duties and reckon with his new social arrangements with his trench assistants (see Section 5.2.5).

It is also important to note that archaeological projects' organizational structures are a form of social infrastructure in that they establish the professional channels through which information is expected to flow. In other words, they serve to direct labour towards productive ends, and legitimize archaeological findings by normalizing the division and distribution of materials to specialists, whose experience and in-depth knowledge grants them epistemic authority to ascribe valid meanings to the things they examine. This is perhaps most clearly evident in the way Chris is considered to be an authoritative figure when it comes to collecting and managing spatial data in Case B (see Section 5.3.3), and in how visiting consultants work with permanent specialists to support the legitimization of knowledge (see Section 5.5.2).

Examining archaeological organizational structures alone is insufficient for obtaining a full understanding of archaeological collaboration. The following chapter will consider how people occupying the roles outlined above perform coordinated action through mutual participation in various archaeological activities. In Chapter 6, I explicitly frame activities as sites of discursive negotiation, wherein project participants, acting in accordance with their respective roles, converge on an entity or objective of mutual concern, and must reconcile their different perspectives. Moreover, I highlight how tools, media, and protocols contribute to these role-relations by structuring and directing the flow of information in accordance with certain value regimes and non-neutral epistemic objectives. In other words, I extend the work presented here by articulating how archaeological activities are arenas where collaborative commitments among the actors involved in the social worlds outlined above are reproduced and reinforced.

Chapter 6

Sites of Discursive Negotiation

In the previous chapter, I identified various domains of archaeological research that contribute to the advancement of three archaeological projects towards their goals. In describing the values and commitments that each domain entails, I began to identify certain kinds of interactions that are each expected to perform in relation to others. Many of these interactions represent reflections about the function of each subworld within the greater whole, as viewed from the perspectives of participants who belong to each domain. However, in many cases, these accounts represent normative values and processes, or plans of action that present how things *should* be done, rather than how things are *actually* done.

This chapter dives deeper into the particularities of various archaeological practices, in ways that highlight granular processes of information capture and transformation. I articulate the kinds of commitments that various tools and practices used and enacted in the cases I observed afford, and which are indicative of broader value regimes (to be discussed in greater depth in Chapter 7). I frame these as acts of data curation and sites of discursive negotiation. They also relate to tensions among the subworlds described above and their respective commitments to advancing a project towards its goals and to the development of archaeological knowledge more generally.

6.1 Using recording sheets and field journals

The most acute and visible mode of information work within archaeological projects consists of acts of recording: filling in recording sheets and writing notes in a field journal. Here I will describe my observations of these recording practices at the three

cases, and how these practices were situated within the apparatus of archaeological knowledge production.

A recording sheet is a sheet of paper, or a digital facsimile thereof that contains a series of empty fields that responsible supervisors are to fill in. Recording sheets typically comprise multiple sections that prompt the user to provide different kinds of information. These sections are not necessarily bounded in a spatially cohesive way, but generally correspond with different means of engaging with and recording archaeological entities.

In my analysis of the context recorded sheet used by Case A, I identified five main sections (see Figure 6.1). First, a section is dedicated to store indexical information that identifies the locus, or excavation unit, to which the sheet pertains (i.e. the unique identifier for context, trench, survey unit or feature, as well as the date of fieldwork). This section also identifies the people who were responsible for identifying, articulating and recording the locus and its attributes. Second, throughout the document, and clustered into subsections corresponding with different kinds of materials, the recording sheet prompts users to provide structured information according to a controlled vocabulary, as documented in the fieldwork manual or on the recording sheets itself. Fields prompt users to record the things they found, the depth of the trench in various locations, the properties of the soil, and the equipment they used for excavation. The third section prompts users to describe the excavation unit in their own words. This allows them to highlight relationships among entities within the locus and among loci.[B33] The fourth section prompts users to relate the record with other media pertaining to the same archaeological entity (such as photographs or illustrations) and to documents corresponding to other related archaeological features. Finally, the fifth section contains a blank grid and a blank Harris-matrix chart where users may draw and identify the locus, surrounding loci, and any significant aspects in a visual or schematic form.[B33]

Fieldworkers perceive recording sheets as formal documents that are meant to contain official or authoritative accounts of each locus and its material properties.[A130, A131] Consequently, new fieldworkers often feel a need to ask questions about how they should fill out these forms to meet the expectations of the project.[A132, A133] Moreover, they typically consider filling in recording sheets to be the purview of trench supervisors, while assistants rarely have the opportunity to do any of this work. If they do, its intent is to serve as an opportunity for the assistants to learn how to be-

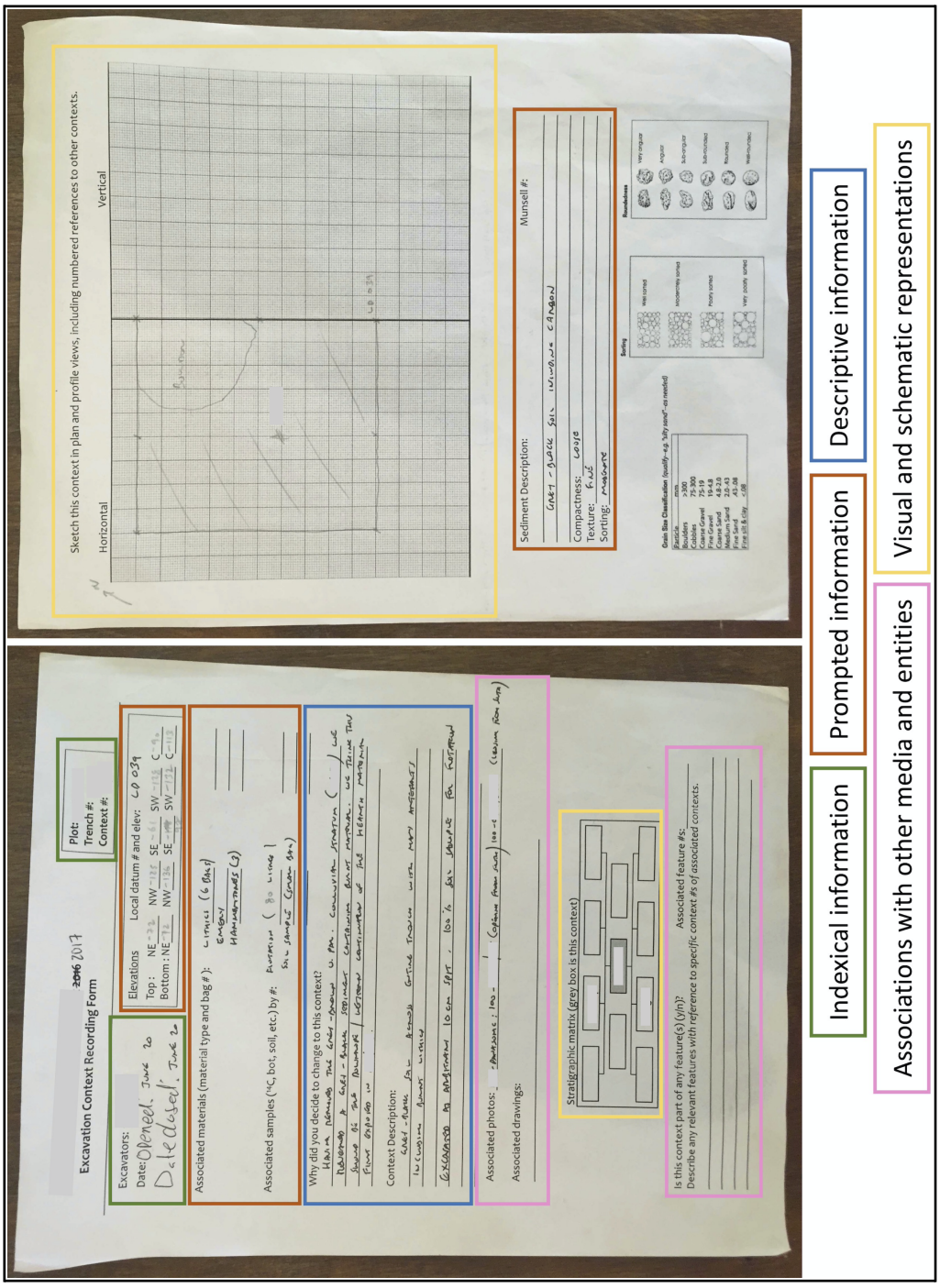


Figure 6.1: Breakdown of an archaeological recording sheet, highlighting sections dedicated for indexical information, prompted information, descriptive information, associations with other media and entities, and visual and schematic representations.

come competent as a trench supervisor.[A12, A134, A135, A136] Filling the forms represents a bureaucratic obligation that someone in a particular position carries out and bears responsibility for their accuracy and completeness.[A137]

While recording sheets are considered official records, they are sometimes also viewed as cumbersome obstacles that distract from ongoing work or that fail to capture what is really occurring in the trench. For instance, Theo, a seasoned fieldworker at Case A who eventually became field director, is somewhat dismissive of the recording sheets and somewhat resentful of the demands that they impose. He believes that context sheets force him to write his observations in unnatural ways, forcing naturally fuzzy information into strict and arbitrary forms.[A130, A138] According to Theo, over-complicated recording sheets have "like a fuck ton of tick boxes, or just sort of, like all of the options in the world."[A139] The problem is not rooted in the set choices available; it is a reluctance to be forced to use terms that he does not consider to be valuable representations of what is supposed to be represented. For Theo, recording sheets are tools that warp reality into an overcomplicated beast that largely serves those who work in abstractions of reality (i.e. database managers and bureaucrats). Ben, on the other hand, simply feels resigned to work using the system given to him, and does little to push the boundaries that the recording sheet imposes.[A140]

Archaeologists often compare recording sheets with field journals, the other prominent recording medium in fieldwork.[A141, B34] A field journal takes the form of a bound notebook, where trench supervisors note all work occurring in a certain trench or on a particular endeavour.[A142, B33] However, their use is not necessarily restricted to fieldwork. For instance, journals are sometimes used to track work pertaining to lithics analysis, ethnobotany, database maintenance, etc., but their use in these contexts is rarely mandated by the project and is largely considered part of a personal knowledge management strategy that individual specialists implement while working of their own accord.[A87, A131]

According to Theo, field journals record a "stream of consciousness" and provide a more genuine account of what occurred in the field.[A142, A143, A141] They enable a reader "to understand what the excavator was thinking ... whilst they were excavating."[A142, B34, B35] They serve as mnemonic devices that preserve memories of the reasoning behind decisions that excavators made, but which they may forget during the flurry of activities that they must perform, or that may fade from institutional or collective memory as fieldworkers move on to other projects or otherwise become

inaccessible.[A142, A144, A145, A141, B35, B34]

While Theo claims that "in the journal you can just write the fuck you want, pretty much,"[A130] there are professional expectations that guide what information supervisors should record in field journals and how they should structure that information.[A146] As with recording sheets, field journals typically comprise a few sections (see Figure 6.2). First, they contain indexical information that identifies the endeavour (i.e. the trench or specialty) to which the journal pertains, as well as information about who is responsible for leading or carrying out the work. This typically occurs on the cover or first page. Then, the journal entries themselves follow. These are typically recorded on a day-by-day basis rather than ordered by unit or locus. Each entry may contain its own indexical information such as the date, a list of people involved in the work, unique identifiers of contexts being worked on, etc. Entries also typically mention the conditions or circumstances under which work is occurring, such as the weather, remarks about the crew's general attitude and morale, or any disruptions that may have occurred that day (Figure 6.2 - [A] and [B]). They may also list the goals set out for each day of work, relating entries to each other and leading to the formation of quasi-narratives about work progress. The main content of journal entries consists of a log of decisions that the supervisor made and instructions to and carried out by assistants. They also include fleeting interpretations of phenomena being uncovered, revealing why and how certain decisions were made during the work process. Journal entries also commonly use colloquial language and refer to entities they recover in a very casual way. For instance, the journal entry depicted in Figure 6.2 - [A] refers to areas of the trench as the "sand pit of doom" and "bouldery hell".

The field journals I examined are crafty, multi-media documents. They often contain sketches or schematic visualizations of the trench, of the landscape, of relevant features, or of mental models, scattered throughout the notebook (Figure 6.2 - [A], [B] and [C]). Sketches are without scale and entities are labelled only when the illustrator deems necessary at the time of drawing. They also sometimes contain hand-drawn tables recording regularly-formatted data, such as running lists of photographs taken, of contexts opened, of special finds and their spatial coordinates, or of samples taken (Figure 6.2 - [D]). Because these tables are typically recorded at the end of the notebook and are filled in as new pertinent info comes across their radar, they tend either to run out of space or to reserve too many extra pages. Sometimes, tabs added to the edges of those pages using a piece of paper reinforced with scotch tape make

them easier to access. Notebooks sometimes have pages ripped out, or have pages informally added with tape, glue, or a stapler (Figure 6.2 - [C]).

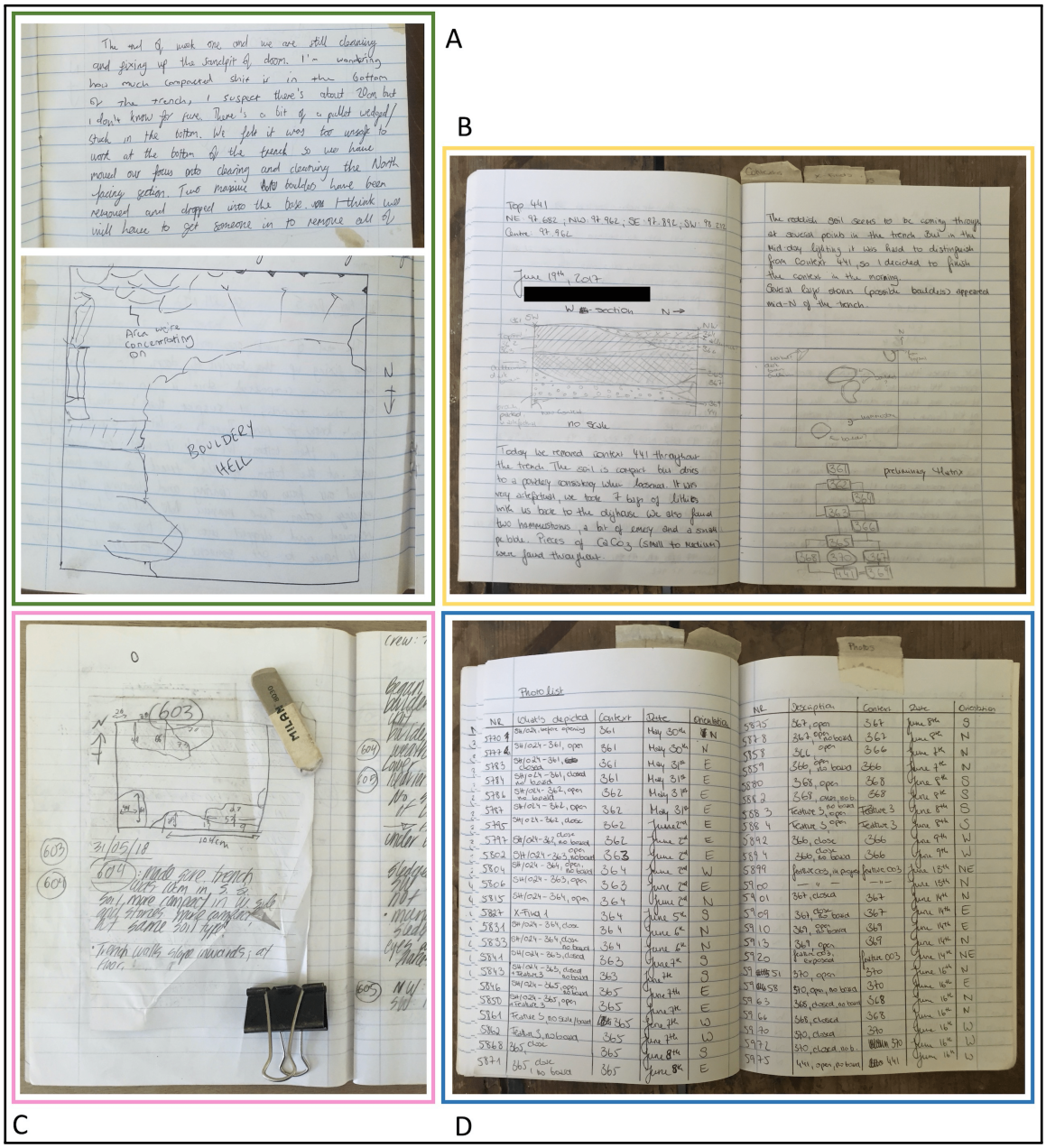


Figure 6.2: Breakdown of archaeological field journals.

My observations correspond with other studies of archaeological field journals. Mickel (2015) made similar observations at the Çatalhöyük Project, whereby field-notes draw together observations about archaeological entities of interest and their contributions to the development of legitimate narratives or explanations about them. Moreover, Hacıgüzeller et al. (2021: 1726), building upon Hodder's (1989) earlier cri-

tique of formal archaeological writing practices, similarly demonstrated the value of fieldnotes' relatively unstructured character, and argued for the value of media that "encourage and reflect emotion and embodiment, equivocation and difference, and partiality and closeness". These reflections correspond with my view that field journals provide the capacity to highlight relationships between objects and phenomena of interest at a very early stage, when these relationships are still emerging at an early, intuitive level.

In a similar vein, Eddisford and Morgan (2019), Yarrow (2008), and Sandoval (2021) looked closely at the recording sheets that fieldworkers created and highlighted the personal flair that the unique individuals imprinted while articulating their observations. Eddisford and Morgan (2019) most attentively highlighted the traces of human agency, such as inside jokes or off-topic notes-to-self that sometimes occupy the page margins but are essentially ignored when transcribing these records to more formal documentation. Eddisford and Morgan (2019: 251) drew upon these observations to argue that the distribution of interpretive agency among excavators, as facilitated through use of pro-forma recording sheets, "promotes individual empowerment of diggers, allowing them to contribute to collective knowledge construction on site" and "promoted a more horizontal management structure ... [that] encouraged other forms of discourse and community building and camaraderie, such as trenchside discussions and improved health and safety practices." This squares with Edgeworth's (2003: 253-254) account of how records about objects of interest were recorded through conversations among groups of archaeologists, rather than being produced through strictly individual actions. These efforts, which showcase fieldworkers' hidden voices, include work that examines other media through which fieldworkers creatively express their engagement with archaeological sites cf. Mickel (2021), Morgan and Eddisford (2015), and Morgan (2019). These studies are quite interesting in that they highlight aspects of recording sheets that exist alongside what will eventually become data, and which are ultimately swept away, ignored and sanitized out of the "official" archaeological record, thus revealing how these experiences are devalued. They show how signifiers of the contexts of their creation must be removed in order for data to be published, shared, and re-applied in secondary or functional analytic processes. Records must be made facts, stripped of their subjectivities.

Recording sheets accomplish this by prompting users to record specific sets of observations in a particular way, thereby ensuring collection of a consistent dataset that contains all the information outlined in pre-defined guidelines and parameters.

This facilitates re-assembly of the information that a distributed work-force, operating in many settings, collects with relative ease (Star 1993). Yarrow (2008) described how the physical properties of recording sheets, including their portability and ability to be combined or shuffled, makes them suitable for working around the complex contingencies of working in relatively unpredictable fieldwork settings. This also facilitated assembling many pages into ordered sets that match the arrangement of entities commonly encountered during fieldwork. The recent advent of "paperless" recording strategies, whereby users enter information directly into a database through digital facsimiles of pro-forma recording sheets, enhances this ability to atomize information and to control information intake with an eye to facilitating digital data processing and analysis (cf. Berggren and Gutehall 2018; Jackson 2017; Ross et al. 2015). Moreover, proponents of paperless archaeology are very concerned with ameliorating archaeological workflows, or ways of directing the actions that various agents involved in an activity perform. This typically involves imposing rule-sets on their behaviours to ensure fluid transmission of information along predefined pathways (Berggren et al. 2015; Berggren and Gutehall 2018; Caraher 2022). However, these systems lack the material character that enables fieldwork experiences to be expressed. For instance, the mud stains and tattered corners, which ensure that recording sheets and drawings remain viscerally grounded to the site (cf. Yarrow 2008; Bateman 2006) are set aside in favour of the delayed satisfaction of formulating a sanitized and consistent dataset down the line.

My interviews corroborate the view that fieldworkers fully understand the implications of this shift (Batist et al. 2021). Theo is utterly indifferent and dismissive of analytical work, especially work by those who have little to no experience doing fieldwork.[A10] Similarly, in an unrecorded conversation, Rufus highlighted the need to combine digital tools and systems (which seem to be intertwined with the notion of digital workflows) with considerable fieldwork experience. According to Rufus, tools for recording and analyzing data should not be plug-and-play; they should be responsive to the specific circumstances of their application.[B36]

Key to all of this is the dependency on data models that stipulate how observable entities should be recognized and recorded. Computing deals with models, not reality, and recording sheets are one of the primary means for representing reality according to a project's model of the world (Banning 2020: 49-50). However, the model itself is codified in field manuals and internalized by experienced archaeologists (Banning 2020: 1-2). Field manuals are usually unpublished internal documents that instruct

team members, and fieldworkers in particular, how to identify and record objects of interest in a standardized manner that project leaders deem acceptable. Field manuals document methodological procedures, and are sometimes cited to indicate the protocols that were followed while collecting and analyzing data. However, according to Huvila, Andersson, and Sköld (2022) and Huvila, Börjesson, and Sköld (2022), these citations carry subtext and their meanings may vary depending on the contexts in which they are applied. For instance, an archaeological report may refer to a field manual to identify some generally accepted concepts or practices, to highlight how the project worked around or incorporated a challenging situation, or to contrast what actually occurred with some normative procedure. Although manuals are not exact representations of how work actually proceeded, they do provide some indication about how certain information is valued and how projects imagine their data will be made useful. By tracking diachronic changes to a field manual, it may be possible to trace a project's shifting priorities over time.

Interestingly, the digital recording interfaces of paperless systems circumvent much of the need for meticulously documented data-collection instructions by setting up built-in control mechanisms. For instance, dropdown menus may provide users with a predefined set of terms drawn from a controlled vocabulary, and there may be checks that ensure that a record is complete before allowing a user to move on to another one. This offloads much of the decision-making to the tools and grants significantly more agency to the tools' designers, at the expense of those who work out in the field and those responsible for assembling and cleaning records as datasets. Moreover, these decisions are not typically documented, as they would be, at least implicitly, when preparing a field manual.[6]

6.2 Capturing visual media

Visual media have long been an integral component of archaeological practice. Their main purpose is to create a representation of an object in a way that portrays its physical proportions and spatial configuration. Archaeologists accomplish this using systems that transpose spatial configurations onto mutable and mobile media. With photography, this involves sensing and storing the patterned reflections of photons, whereas illustration involves creating parallel environments on paper or digital planes

6. Although some readers may point out that archaeologists *should* formally document these decisions, this is one of many instances where actual archaeological practices tend to deviate from "best" or "standard" professional practices, at least in the cases I observed.

and establishing means of translating observed spatial relationships onto them. As we shall see, these means for capturing an image of an archaeological object of interest contain different underlying mentalities, value regimes and affordances for future use of the outcomes they produce. These distinctions, and the ways that they have been incorporated into archaeological information management systems, reflect broader tensions regarding pressures to digitize and automate fairly common archaeological practices.

In my work at Case A I observed how archaeologists illustrate trench sections in fieldwork settings. Archaeological illustration operates by establishing a set of parallel environments and a means of translating spatial configurations between them. This is accomplished by imagining the object of interest as if it is overlaid upon a two-dimensional grid, with a parallel grid represented on a sheet of graph paper. While largely abstract, the grid imposed on the trench section contains certain physical components. Specifically, archaeologists establish physical reference points using taut, level strings laid out horizontally across the trench, secured with nails or rebar. Tape measures are aligned along the string and the vertical span of the trench. A nail placed in the corner of the trench is also established as a known spatial point, whose precise location is determined by spatial data specialists using theodolites, GPS, total stations or other means at their disposal. The height of the string and the positions of the trench corners are determined in relation to this fixed point. A similar grid is established on a page of graph paper, and congruent reference lines are drawn in relation to a fixed point marked on the page.[A147]

After establishing a congruent grid on the page, the illustrator identifies significant spatial points along the baulk (vertical plane of one side of the trench) and determines their positions in relation to the reference lines. For example, the illustrator may identify the position of a boulder's corner by counting the number of centimetres below the reference string and the number of centimetres from the edge of the trench. The illustrator uses a plumbob to ensure that the line they measure is precisely vertical, so as to minimize angular distortion when transposing real-world entities onto the grid laid out on the page. Then they mark a dot on the page at a position that is the same number of distance from the congruent reference points but measured using millimetres. After plotting a series of points in this manner, the illustrator connects them with curves or line segments, attempting to match their perception of the boundaries between materials.[A147, B37]

The illustrator then identifies significant spatial points that correspond with meaningful material intersections, for instance the corners of large boulders or points along a stratigraphic interface, and expresses the points' positions in terms that specify the number of centimetres distance between a point and the string and between a point and the position of the intersecting baulk, with reference to the measuring tapes. The illustrator then places a dot on the page at a position that represents an equivalent intersection, but at a smaller scale. Plotting more points makes it easier to draw a more precise line, but experienced illustrators are relatively adept at matching the observed interfaces on the page.[A147, B37]

After all the significant lines are drawn, the illustrator erases any arbitrary control lines and reference points, and traces the pencil-drawn lines with ink to enhance visual contrast and clarity. They then apply patterned in-filling to the shapes between the plotted lines to represent different kinds of objects. For instance, the illustrator may represent clay soils with diagonal lines, and fill the outlines of boulders with fine, speckled dots. The illustrator may also demarcate the precise location where a sample specimen was taken by plotting an icon at the appropriate grid coordinate, or may annotate the image with the elevations of significant points as determined with reference to fixed spatial points that the spatial data specialist recorded.[A147]

Although I have not directly observed artefact illustration as part of this dissertation, it involves a very similar process (see Adkins and Adkins (1989) and Griffiths, Jenner, and Wilson (2007) for more detailed overviews of artefact illustration procedures). However there is greater emphasis on applying visual cues through use of common conventions, which convey specific information about the objects they represent (Banning 2020: 351-361). For instance, the top and bottom points are more explicitly articulated to facilitate comparing drawings of the same artefact from different spatial perspectives (i.e. dorsal, ventral and edge perspectives), and line widths and dotting convey specific meanings regarding the artefact's physical properties, such as to account for weathering processes or whether a broken edge is ancient or a product of modern intervention.

Illustration in fieldwork settings can be performed independently but it is also common for two people to collaborate on this task. In such cases, they communicate using language that reflects the mindset that this process calls for. For example, I observed Jane standing at the edge of the trench saying something like "at x on the horizon, it's y down", and Theo who was holding the drawing pad would reply either

with an acknowledgement that he understood the coordinate and had finished plotting the point, or by asking her to repeat it in case he did not hear her properly.[A148] They established a comfortable rhythm, and adjusted the volume and tone of their voices to account for any initial miscommunication or difficulty hearing the sound of the others' voice over loud gusts of wind. The terms they used were ones they adopted on the fly, and they needed only a basic understanding of the principles behind the technique to formulate a script that included the identification of vertical and horizontal variables, their mutable values, a connective term to draw an association between them, and an exclamation to indicate that a coordinate had been successfully recorded and that they should continue on to the next point.[A148] This is the framework for language that allows mutual comprehension and translation of physical spatial configurations onto the page.

It is also notable that archaeological illustrators find it necessary to work with material with which they are familiar, or alongside people who already have such familiarity.[A148, A149] For instance, a trench supervisor must be present to help identify where a stratigraphic interface should be delineated, or to identify which boulders or other materials jutting out from the baulk are worth recording. In this sense, a section drawing is a representation of meaningful information rather than a direct image capture. It serves as a schematic document that conveys archaeological encounters, rather than as a literal representation of an object of interest.

Contrast this with archaeological photography, another means of imaging that archaeologists commonly employ in their fieldwork. Photography differs from illustration in that it captures an object's likeness as a whole, and does not account for the storied process through which the object obtains archaeological meaning. Photography does involve active decision-making, like deciding what is worth recording, or deciding how to adjust the environment and how to configure the camera to account for the photographer's understanding of how their camera will respond in a specific set of conditions. But, by-and-large, archaeological photography is more concerned with obtaining a record of an object rather than a representation of objects in relation to other forms of archaeological information. Photographs serve as records that stand in for a physical object or set of material configurations that are generally not accessible, either because they are destroyed through excavation or because logistical constraints make it difficult to directly engage with the physical object or collection.

This is evident through the fact that, in the cases I investigated, much of a pho-

tograph's significance stems from its associations with records made about it. In Excerpt 6.1, Chris explains how each photo is recorded in a "photo log" or a spreadsheet, which identifies the objects photographed are documents the circumstances under which the photos were taken.

Excerpt 6.1. Chris explains the photo log.

Zack:	Can I get a brief shot of the page, what you're writing there?
Chris:	Sure.
Zack:	Yeah, it's just basically a photo log.
Chris:	Yeah, just a photo log, just making little notes, and then I transfer it to a, like a spreadsheet.
Zack:	You keep track of the photo number? Like the file name?
Chris:	Yeah, so everything, so what I do is I copy like a reference to the image file name in that spreadsheet, and every photo, and each photo is labelled like [redacted identifier]_P1, _P2, like for each, each, each umm stratigraphic unit.[B38]

Some information about the photo is also hard-coded into photos themselves. This includes a scale, a Northing and colour grid, as well as a slate that identifies the trench, the date and personnel responsible for the work within the frame as the photo is taken (see Figure 6.3). However, in fieldwork settings, the information that these devices convey may be quite imprecise and serve more as "hints" on how to proceed with an investigation rather than as truly reliable foundations for knowledge construction.

Despite difficulties working in such relatively inconsistent and uncontrollable environments, this strong association between photos and *records of* photos has contributed to a treatment of archaeological photography as a form of data collection. This consequently requires its performance with consistency and in a relatively "objective" manner. For this reason, data management specialists often direct that photography in fieldwork settings be performed in a way that conforms to their requirements.

This is especially evident when photography was performed by trench supervisors instead of a dedicated field photographer, as was the case in Case A. Trench supervisors were instructed to capture a specific set of images when triggered by certain events, e.g., when opening and closing a trench or after identifying a significant archaeological feature, and these instructions also told them how to optimize the out-

Figure 6.3: Archaeological photography in the field involves relating the photograph to other records about the object being photographed.

puts of their efforts, e.g. managing lighting and eliminating problematic shadows. However, they rarely make clear the significance and value of this work to the fieldworkers who actually take the photographs. Instead, the creative acts of designing a photography protocol, selecting and configuring equipment, and establishing how to process relevant information about a photograph are delegated to those who serve a managerial role.

This is illustrated well by work performed by John, a research assistant tasked with taking photographs of archaeological artefacts in a museum collection, using a relatively controlled setup. John described his work as following a formulaic protocol. He was assigned to work using a camera rig designed to take photos in quick succession. He described it as "a photography stand . . . with the camera sort of mounted up [on top] . . . and it's all stationary."[C43] After setting up a consistent and unchanging lighting environment, he is simply responsible for "putting an object in place, adjusting the focus, and that's about it."[C43] Photos are uploaded directly onto a computer, and the digital files are then quickly processed using rote logic to assign appropriate metadata and integrate them into a central database. John's camera rig and the establishment of directed photography protocols are physical and social manifestations of workflows, which, as I describe in Section 2.2, are disciplined ways of working that involve a shift in the relative power held by human and non-human agents involved in an activity.

More generally, the adoption of workflows in archaeological photography may be partially attributable to technological change. When photography relied on film as a medium for capturing images of archaeological entities, which was relatively scarce and took lots of time to develop into finished photographs, photography was a specialist activity. A sole photographer who carried specialized instruments (digital single-lens reflex [DSLR] camera, scales, and light meter) would be called upon to take all official photos of noteworthy finds and features (cf. Dorrell 1994; Shanks and Svabo 2013). But technological advances in digital photography that have become widely available over the past two to three decades, including instant image rendering, cheap and plentiful digital storage, fast electronic file transfer, and reduced or eliminated cost of equipment (e.g., dark rooms, developing fluid, flash bulbs), made it possible to reduce, and even eliminate, the need for a specialist photographer in most archaeological projects. Now fieldworkers may be quickly trained on the job or be made to follow standard photography protocols using widely available and relatively high-quality cameras, or even using cameras integrated into their own smartphones.

Archaeological fieldworkers can thus be made to capture objects visually as if they were machines, according to predefined protocols, stimulated by certain triggering conditions, and using the cheapest approach available. It is not necessary to waste time training photographers to understand how a camera works and how to set up their equipment in a manner that yields good results, when it is more efficient to delegate these creative acts to experts who design systems and document the operational specifications in excavation manuals that fieldworkers are expected to follow blindly. Fieldworkers are rarely taught how a piece of equipment works; instead, they are taught how to operate it.

One notable requirement in modern archaeological photography is the need to capture "complete sets" of photos, i.e. photos of a trench opening and closing, with and without a photo board for each instance. In this sense, archaeological photography becomes just one aspect of formulaic data-collection procedures, and is regarded with a checklist mentality. It is common for trench supervisors to become impatient and eager to move on to other work, while neglecting to set up their frame in a manner that ensures higher visual quality. They may also take more photos than are necessary and opt to sort through them later to find the best ones, but this does not ensure that any of the photos will be good. The photographer will have to choose the best of a set of poor options, which is hardly optimal (Knoll and Carver-Kubik 2019).

That being said, Morgan and Wright (2018) also drew attention to the ways in which archaeological photography, including acts of image manipulation, can enhance archaeological understanding if performed in ways that are reminiscent of the intimate engagements necessary to generate informative illustrations of entities encountered during fieldwork, such as archaeological illustration, which remains a relatively specialized activity. As a document about the archaeological encounter, a photo must be created by someone who knows what they have recovered and why it is significant. For this reason, archaeological illustration also remains a constituent of archaeological fieldwork, and has not become simply an extension of the data-management domain. However, there have been attempts to do precisely this, particularly through digital annotation of archaeological photographs and certain applications of photogrammetry (Morgan and Wright 2018). But these attempts have met resistance through the same mechanism that makes archaeological illustration unique, namely an effort to situate these practices as activities that primarily deal with archaeological encounters rather than as creating simulacra of archaeological objects.

The case of photogrammetry, also known as structure-from-motion imaging, warrants further consideration. Photogrammetry operates by inferring three-dimensional geometry from a series of two-dimensional images of an object taken from multiple overlapping perspectives. The points of overlap serve as common reference points for construction of a unified three-dimensional model. I observed this process at Case B, as performed by Rufus, who is a pioneering figure in the use of photogrammetry in archaeological fieldwork settings.

Before photogrammetric imaging can begin, it is necessary to identify an object of interest and fieldworkers expend a great deal of effort to clear light debris and particulate matter from all around the target object. The area is then cleared of all equipment and personnel, save for spatial targets placed around the object whose precise locations will later be recorded with the DGPS. Wielding a high-resolution digital camera, Rufus frames in his mind the area around the object as if it were at the centre of a conical grid. Starting in one position, he proceeds to take a series of photos of the object, shifting his position by moving one step laterally around the object before each shot. Once he completes the circuit around the object he takes a step back and repeats the process, effectively walking a series of concentric circles around the object. Afterward he goes right up to the object and takes a few more detailed photos up close and from perspectives whose angles intersect at more acute angles. As he moves, Rufus is wary to not cast shadows on the object of interest. Once he captures all the photos, Chris comes in with the DGPS rover and records the locations of the spatial targets. These will be used to calibrate the spatial measurements and rectify the model against local and global geographic coordinate systems.[B39]

After returning to the dig house, Rufus transfers the photos to his computer and sorts through them. He imports them into Agisoft PhotoScan, a software suite that facilitates "stitching together" a 3D model from multiple constituent photographs. After importing them, he visually examines each image and discards those that he believes will disrupt the model. He makes this determination on the basis of his prior experience, which has allowed him to understand what characteristics of input images produce results of varying quality. The software then identifies points that various photos have in common and infers three-dimensional geometry based on the shifting perspectives among them. Rufus then inspects the 3D model to determine whether there are any smudged or imprecise areas and, if there are any problems, he recalibrates the software parameters to account for the imperfections. He draws

from his years of practical experience, as well as deliberate and controlled tests that applied different parameters on relatively simple toy datasets, to guide his decisions in calibrating the software.[B39]

He Rufus explains in Excerpt 6.2, photogrammetry involves a very precise and intentional set of actions that he must coordinate in a manner that foresees potential issues, such as the problems brought on by the inclusion of shadows, in subsequent stages of work:[B39]

Excerpt 6.2. Rufus describes how he accounts for potential issues that may disrupt the assembly of a 3D model.

Rufus: So the basic thing with the shadows is that, if my shadow is right here, and I take a picture, and then I take a picture over here and my shadow has moved, the photogrammetry can't find similar points of interest. Because it's looking for that shadow but then suddenly that shadow's in a different position in another picture and as far as the alignment goes it's a big mess.

Zack: Ok.

Rufus: So I always have to keep an eye on my shadow. Obviously grasses and things like that create a problem because they're really long and skinny and they can move one way or the other. And again, it's for points of emphasis, for similar features on multiple pictures.

Zack: Ok.

Rufus: So when you take your pictures you have to make sure you uhh, have enough, you do it systematically and you do it so you have enough overlap, so you know like like 30% per picture. I'm just gonna move things out of the way a bit.

[Rufus moves some buckets]

Rufus: So the idea is you start farther out, you take pictures around. And then you go in, take pictures in a circle, and then you go over the object and take pictures that way.

Zack: Alright.

Rufus: So that's the, that's the goal here.[B39]

He performs his work with particular outcomes in mind, specifically the ability to obtain a precise and georeferenced model against which object distributions can

be mapped. There exist more general-purpose tools (i.e. smartphone apps like 123D Catch) that enable creation of similar-looking outputs by following a simplified set of instructions in the app (presumably written by the app's developers).[7] In general, Rufus would not consider the people who use those tools to be photogrammetry experts. For Rufus, his knowledge of how the mechanism works and the ability to assemble one's own creation from basic components and principles are what sets him apart as a specialist in this matter.[B25]

Rufus also believes that photogrammetry should be performed with purpose and not as an end unto itself.[B25] As with photography, photogrammetry serves to preserve a moment in time prior to the destruction of a particular material arrangement, but it also involves collecting a greater amount of precise spatial data. This makes the resulting 3D model useful as a means for obtaining precise spatial measurements, or as a photorealistic backdrop against which to plot artefact distributions. In this sense, a 3D model derived through proper photogrammetric procedures is effectively considered a formal dataset akin to a raster image or a geometry element in GIS work environments. In other words, photogrammetry involves capturing objects in the world around us as formal spatial data.

Interestingly, in an unrecorded conversation Rufus expressed his belief that photogrammetry is a fieldwork practice, rather than something that "digital archaeologists" with little fieldwork experience should perform. It is a drawn-out activity that necessitates direct engagement and familiarity with the object of interest. In thinking about how each stage of the photogrammetry workflow will affect the next and eventually culminate in a compiled image, Rufus and Liz recognize the impacts that their decisions made at various stages in the process will have on the final product, for example, when clearing debris or when discarding blurry photographs.[B40, B41] Rufus values awareness of the context of creation and holding an involved connection with the process through which the dataset is developed.

In all of this, a clear tension is evident with regards to the treatment of visual media either as products that stand in as relatively stable representations of objects of interest, or as manifestations of cumulative archaeological engagements. Attempts to automate or systematize creation of visual media largely focus on objects themselves,

7. LiDAR sensors, which have become much more compact and affordable during the past few years, are now built into consumer electronics, but I have not directly observed them being used in archaeological field settings. See Cohen-Smith et al. (2022) and Teppati Losè et al. (2022) for overviews on this topic.

whereas resistances to these efforts tend to be most prominent in cases where the agency of the people who capture visual media is deemed more valuable.

6.3 Collecting and managing spatial data

Archaeologists are very concerned with accounting for spatial distributions of the objects they recover. Every artefact, feature or interface an archaeologist encounters can be characterized in spatial terms. Here I will describe various techniques that archaeologists have developed to help systematize the collection and integration of spatial information, and relate these practices to emerging tensions pertaining to the coordination of labour and data.

A common fieldwork practice in archaeology is the use of site grids (Roskams 2001: 95-101), which were also employed in the cases I observed. The purpose of site grids is to place highly localized observations within broader integrated systems, namely the project's GIS. Site grids are created by marking a series of points in the physical landscape with project-specific geospatial coordinates. These points may also correspond with internationally-recognized global coordinate systems, but projects tend to conduct day-to-day operations based on their own grid systems. Each trench is therefore located near a point with fixed spatial coordinates, and the trench's spatial dimensions can be inferred by measuring distances from that fixed point. These derived locations, whose positions are now known, can then be used to infer an extended network of known points by measuring and calculating the differences between the distances from target points to known points. In other words, fieldworkers leverage the web of inferred points to determine and record the positions of their interventions and of the things that they recover.

Fieldworkers initially record the positions of their finds in relational terms, i.e. as distances in relation to the fixed points from which they measure (see Figure 6.4 and Figure 6.5 - [A]).[A22, B33]

When finalizing their paperwork, they sometimes take on the task of calculating fixed positions from the relational distances they initially measure and record, but this is not really deemed as an essential task within their purview.[A150] This work of converting measured distances into coordinates on the site grid themselves is often delegated to specialists who work with geospatial data.[B33] This contributes to a general distinction between the domain of fieldwork, which is responsible for initial

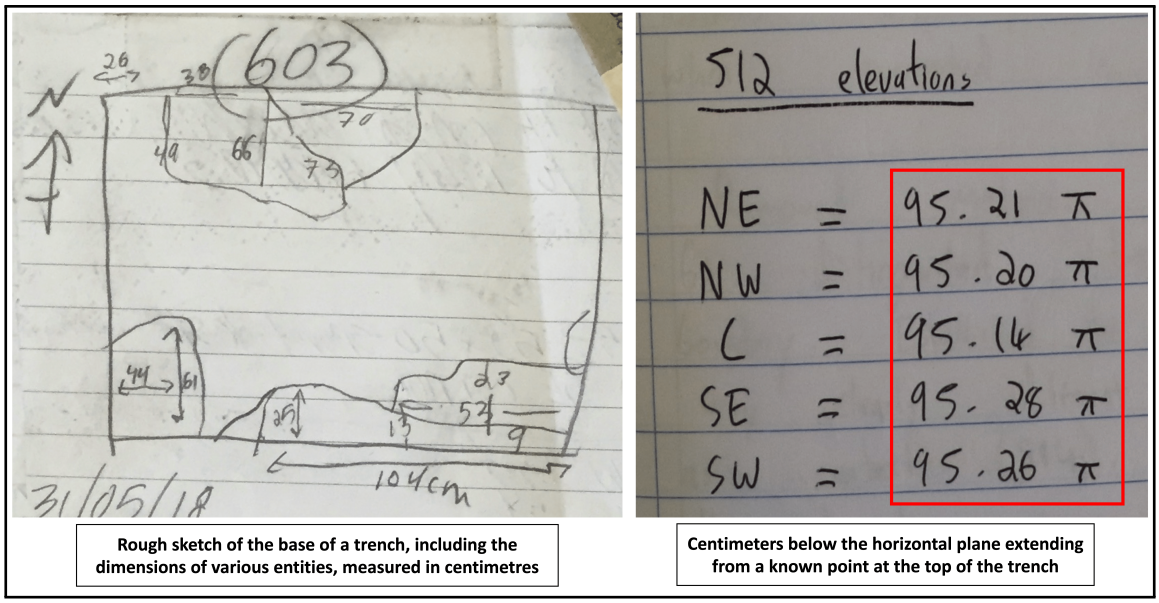


Figure 6.4: Recording spatial information in relational terms.

data-recording procedures, and the domain of data management, which is responsible for conversioning, formatting and cleaning data for analytical and interpretive purposes.

However this enactment of institutional boundaries does not necessarily reflect fieldworkers' lack of interest in relating their efforts as part of global geospatial networks.[A53, A151, A152, A153] Rather, it conveys fieldworkers' extreme sense of focus on the trenches or grids under their direct purview. The grids established by geospatial specialists effectively enable field supervisors to relate their own engagements within their respective trenches and transects to the broader grid, in a way that requires less mental overhead on their part.

Moreover, the indirect relationships that fieldworkers have with the formal site grid serves as a way of maintaining fieldworkers' unique perspectives on the things they encounter. A trench is somewhat detached from the rest of the world in the sense that a supervisor and her assistants develop their own understanding of it and its features. They refer to specific boulders by given names, attribute personalities to certain corners, and are able to communicate about specific entities even while using the vaguest of terms (i.e., "that rock," "over there," "behind you").[A148, A149, A154] Fieldworkers feel *obliged* to record formal distances between entities and are bemused by the stock that data managers and analysts put into these formal values.[A155] They deal with the fuzzy boundaries between strata and the loose distinctions between

Figure 6.5: Recording spatial information in the field. [**A**] depicts a system that measures distance in relation to trench entities. A trench supervisor and her assistant hold a string level and taut (visually highlighted by the yellow line), and then measure vertical distance from the horizontal plane to the object whose depth they want to record. [**B**] depicts a geospatial specialist and a fieldworker determining an object's position using a digital theodolite, which determines distances between the theodolite's known position, a targeted position situated at the top of a stadia rod, and the height of that position in relation to the position of the object they seek to record.

natural and cultural material on a day-to-day basis, and recognize that relational associations, rather than formal recording techniques, are better suited for capturing these aspects of the archaeological record.

Working with string, measuring tapes and plumbobs allows fieldworkers to operate in this relational manner and communicate using the local lexicon of their trench. At the same time, this also provides outputs that are deemed necessary to conduct a thorough integrated analysis and to relate the self-contained sub-system of the trench to a global spatial infrastructure.

However, the gradual uptick in the use of precise DGPS systems may be altering this balance. DGPS systems, such as the one used in Case B, enable fieldworkers to determine an object's fixed position without having to convert between as many relational measurements. While it is true that DGPS positions are inferred, using a rover in relation to a more sensitive GPS unit situated in a fixed location, the people who use this system need only to measure a single point to determine the object's position. Software handles the conversions for them. Moreover, these off-the-shelf tools express each position according to global coordinate systems, rather than the project-specific grid system. Chris, who operates the DGPS for Case B, really values this, since it enables him to instantly visualize the points on maps downloaded from the web, which feature additional data and aspects of the surrounded built landscape that he did not have to add in himself.[B42] The reduced mental overhead and enhanced ease of use encouraged the team to record immense amounts of spatial data, and essentially all their photographs and photogrammetric models are georeferenced as a result.

Fieldworkers were therefore made to think of the data they collect strictly in terms of contributing to a dataset and as feeding into a subsequent stage of work.[B43, B44] Their work is therefore framed as part of a larger workflow, which prioritizes an output (such as a map, spatial analysis, etc) in which they have no direct stake. However, Liz notes how this has the effect of imposing "arbitrary boundaries" on the material, and recalls intentionally *not* gridding the finds in certain situations "to create boundaries that could reflect whatever use the room had in antiquity."[B40]

This also results in a re-delegation of labour involved in spatial data collection. Projects may recruit dedicated personnel responsible for recording and managing spatial information, although they also delegate much of this work to fieldworkers. In cases when expensive or complex equipment is used, or when tools require configura-

tion or additional background knowledge for proper use, fieldworkers typically carry out menial or supportive tasks, such as holding a stadia rod while a spatial specialist is using a theodolite. In these cases, fieldworkers are brought into, and fieldwork is performed in service of, the domain of data management, rather than performing work that grants fieldworkers more creative agency. Again, the object targeted for data collection has priority as the primary concern for the task, and the accumulation of spatial data is almost entirely independent of fieldwork practice.

6.4 Finds processing

Archaeological evidence is the product of archaeological inquiry, whereby materials undergo transformation from being culturally-situated, then part of the historical landscape, into entities that are more amenable to scientific research. This involves some of the aforementioned research processes, including fieldwork documentation, imaging practices and spatial data recording, as well as procedures that are explicitly meant as preparatory tasks for facilitating more in-depth analytical work (finds analysis in particular, as described in Section 5.3. Here, I identify a few of these procedures and their roles within a broader apparatus of archaeological knowledge production, as corroborated by evidence I encountered in the three case studies I investigated.

Finds processing begins in the field, when recovered objects are identified as finds that will yield valuable insight into the lives of past people. Archaeologists divide these finds into broad-level categories corresponding to materials. Some common examples include ceramic, bone and shell. Some categories, like chipped stone and ground stone, refer implicitly to materials and the ways in which these materials become artefacts. For example, chipped stone largely comprises artefacts made from chert, quartz or obsidian, whereas ground-stone tools are mostly made from coarse igneous stones like basalt, rhyolite or emery (corundite). Fieldworkers are responsible for separating these materials as they emerge from the trenches by placing them in bags and buckets labelled with the excavation unit in which they were found (see Figure 6.6 - [E] and [F]) and Figure 6.7).

Moreover, fieldwork is a primary setting where archaeological finds are separated from materials deemed less significant. For instance, fieldworkers toss stones that exhibit no anthropogenic qualities outside the trench where they are no longer accessible by the project (see Figure 6.6 - [D]). Similarly, fieldworkers use sieves to separate loose sediment from small objects contained within it; the sediment passes through

the sieve into "spoil heaps" (or is collected for flotation, described below). Fieldworkers sort through the materials that remain on the sieve, collecting those that they deem culturally meaningful, and discarding the rest (see Figure 6.6 - [A], [B], [C] and [D])).

Figure 6.6: Preliminary sorting of archaeological materials in the field. **[A]:** Placing unsorted material into the sieve; **[B]:** Using the sieve to separate loose sediment from larger objects; **[C]:** Sorting through the larger objects, and keeping the anthropogenic objects in the bucket nearby; **[D]:** Dumping the non-anthropogenic material into the spoil heap; **[E]:** Creating a bag and a tag, which indicates the kind of material contained in the bag ("lithics" is shorthand for chipped stone made from chert in this case), as well as information about the excavation unit and context of discovery (i.e. date, excavators' initials); **[F]:** Placing the artefacts in the bag.

Some finds are set aside at the trench supervisor's discretion, to await consultation with a specialist to determine whether it warrants being saved for analysis.[A156, A157] The trench supervisor may document the findspot in more detail, "just in case," before proceeding with his or her work.[A157] This documentation is tentative, and may not become part of the official archaeological record at the time of its creation.

Figure 6.7: Sorting archaeological objects into bags based on their physical material properties.

If, after further consultation, the item is deemed ordinary, it is re-situated as part of the broader mass of materials of the same type and the additional documentation is ignored.[A157, A68] The power to determine what is actually special in such cases lies with specialists, who inform fieldworkers about the value of the material they want collected. As they engage with specialists in this way, fieldworkers incorporate these guidelines into their own independent decisions.

After hauling all the finds back to the dig house, team members thoroughly clean them. This involves brushing the finds by hand using toothbrushes or brushes meant for shining shoes and dishes, in plain water. Trench assistants perform this task after they have returned from the field, remaining productive even during the late afternoons when it is too hot to perform strenuous outdoor labour.[B45] Trench assistants

gather in a circle or cluster and perform this work as a group. This is a casual, social experience, and helps the team get to know each other. Some participants drink beer and gossip about topics unrelated to work to pass the time. In my unrecorded observations I noticed that people talked about the day's work and their personal and collective experiences, and speculated about the things they recovered and which they were then revisiting in a secondary context. As non-experts, their amateur analyses remain unexplored, but they still feel an impetus to examine these objects and try to develop insights from these experiences. In general, however, this is a task that most people prefer to finish promptly, since it is rather tedious. The work ends when they have finished cleaning all the finds from a specified list of bags. Under optimal circumstances, this is all the bags brought back from the field that same day. However, on any given day, it is common for there to be a backlog and for certain excavation units to be prioritized for finds processing.[B45] When one person finishes the material that they have been assigned to clean, they pick up another bag and work to complete the collective task.

Cleaned materials are then left out in the sun to dry, before being put back in their finds bags and brought to a space dedicated for finds analysis and storage, which may be located in a museum, a museum's annex, or a makeshift lab in or near the living quarters.[B46] Upon arriving in this space, the bags are dumped on a broad table and the materials are subject to initial sorting. This involves quickly going through the materials and discarding any objects that are not actually artefacts. If any mis-sorted materials are found, they are identified and placed where they belong.[A68] Natural, unmodified items are sometimes recovered in the field because it is difficult, especially for less experienced fieldworkers, to distinguish them from artefacts, especially when the materials are still covered in sediment. Team members then count and measure the mass of all remaining artefacts, before putting them back in their bags to await further analysis based on their typological and technological characteristics.[A158]

Flotation is another strand of finds processing. Flotation separates botanical (and some small faunal) remains from other materials contained in samples from an excavation unit's substrate. The substrate, which includes a mixture of sediment, rocks, fragmented artefacts and faunal and botanical remains, is collected in a sack affixed to the bottom of a sieve. The filled sacks are brought back to the dig house and sorted by analytic priority, as determined by the project director or field director. The paleoethnobotanist dumps the sack's contents into a tank, where jets of water agitate and loosen the sediment from more solid remains. The rocks and fragmented lithic

and ceramic artefacts, collectively referred to as heavy residue, sink onto a submerged mesh, while the finer sediment falls to the bottom of the tank. Meanwhile, the botanical remains and sometimes small shells or bone fragments float to the surface, are captured in a fine cloth mesh, and are then hung up to dry outdoors. The heavy residue is removed from the tank and is laid out on the sacks in which the samples were taken, and left to dry. Once completely dry, the botanical specialist examines the remains and compares them against reference collections to identify the species of plant to which they pertain, and also separates out any small faunal remains to pass on to a zooarchaeologist. The dried heavy residue is sorted by trench assistants, who separate the items on the basis of their physical materials and whether they exhibit anthropogenic qualities. Sorting heavy residue is a task that requires focus and patience, and is rather isolating in comparison with finds cleaning, which usually occurs simultaneously nearby. Materials are sorted and sent to the specialists charged with looking at them, or are discarded if they are thought to have no cultural value.

Field projects typically improvise flotation tanks. Often, the project hires a local welder to modify an old hot water boiler, and adds a generic water pump purchased from a hardware store to get the water flowing. They use generic fabric and metallic meshes, affixed to the tank with paper clips.

I observed that working with the flotation tank is generally considered a fun and social experience, as operators of the tank find it quite refreshing to work with water after a day in the hot sun. Like finds cleaning, it is a setting of social gathering.[A159] While flotation relies on common-sense tools and principles, certain individuals usually take charge of them and assume responsibility for maintaining the physical tools, ensuring the integrity of samples, and ensuring that the work operates smoothly. In particular, this involves consulting with the director to determine the order in which samples should be floated, minding when to rinse out the tank to ensure that key samples remain uncontaminated (while balancing this with the time-consuming process of draining, cleaning and refilling the tank, as well as a potential need to conserve water), and recording work progress in a spreadsheet known as the "flot log" (Figure 6.8).

The flot log is representative of paperwork kept for various finds-processing tasks. This involves recording the excavation units from which the processed materials derived, the identities of those involved in the work, the dates upon which the work occurred, and information regarding what specific aspects of work were performed

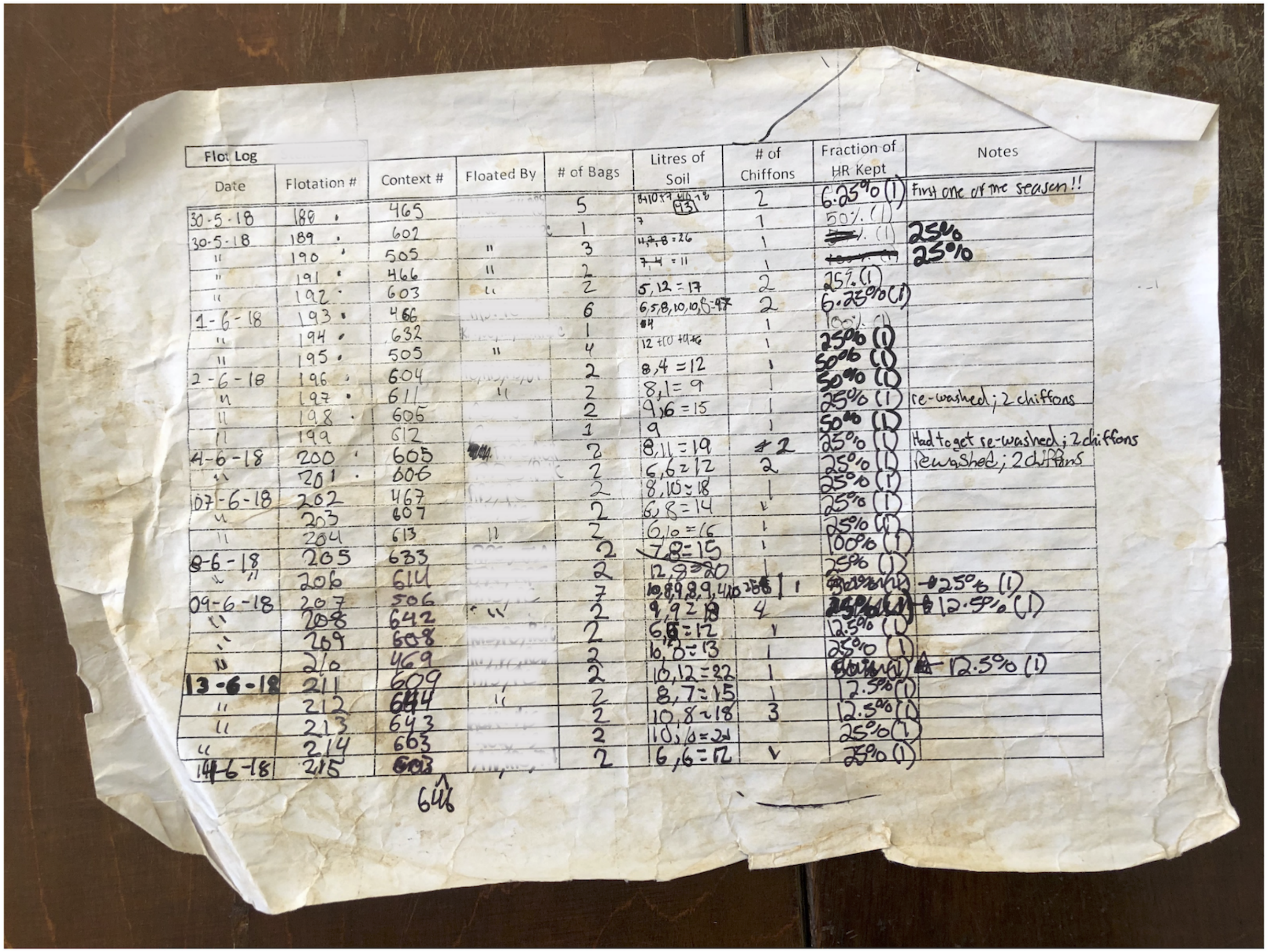
(see Figure 6.8). No new information about the character or meaning of the objects that pass through flotation is recorded, and instead this serves to track progress and verify the integrity of work. No aspect of finds processing involves maintaining a journal or recording substantial interpretations of the materials; this indicates a failure to recognize that any meaningful insights could arise during these stages of work. Finds processing is thus positioned as a means to an end, that being the arrival of cleaned and sorted finds upon the desks of specialists whose expertise is respected and whose work is the source from which the archaeological record is produced.[A129, A69, A41, B9]

The ways in which artefacts are processed during finds analysis further illustrates this. The specialist's assistant has a checklist of all material requiring analysis on any given day, and queues up the bags of material.[A160] She dumps the finds onto a large table, and the specialist goes through and sorts the material, sometimes mumbling her reasoning aloud.[A161] After she has settled on her arrangement of the materials, the specialist dictates her description of the assemblage as a whole, in a fragmented tone that insinuates strong intention behind each word, and the assistant writes down this speech.[A161] The assistant then records the quantities of artefacts in each category, as laid out by the specialist, and enters this information into a spreadsheet or database.[A161] Whereas the specialist is the source of creative knowledge production, the assistant embeds these insights within the project's organizational apparatus.[A162]

The specialist's assistant maintains her own checklist, similar to the flotation log, to track all aspects of work she must perform in each reading of the material.[A160] Database managers and registrars also maintain similar paperwork to trace what records await integration into the database and to ensure that all information was properly recorded[A87, A163]. These organizational processes are particularly acute towards the end of each field season, as everyone rushes to get all their work into the project's information system before dispersing to their home institutions and putting fieldwork out of their minds for a time.

6.5 Maintaining databases

A database is a structured set of data that typically relates different sets of data in ways that facilitate formal or automated data retrieval. Relational databases, which are the most common kind of database for archaeological projects, operate by storing thematically and structurally distinct datasets across a series of tables,



Flot Log

Date	Flotation #	Context #	Floated By	# of Bags	Litres of Soil	# of Chiffons	Fraction of HR Kept	Notes
30-5-18	188	465		5	8,10,7,7,10,7,8 43	2	6.25% (1)	First one of the season!!
30-5-18	189	602		1	7	1	50% (1)	
"	190	505	"	3	4,7,8 = 26	1	[illegible] % (1)	25%
"	191	466	"	2	7,4 = 11	1	[illegible] (1)	25%
"	192	603	"	2	5,12 = 17	2	25% (1)	
1-6-18	193	466		6	6,5,8,10,10,8 = 47	2	6.25% (1)	
"	194	632		1	4	1	100% (1)	
"	195	505	"	4	12+10+4+6	1	25% (1)	
2-6-18	196	604		2	8,4 = 12	1	50% (1)	
"	197	611	"	2	8,1 = 9	1	50% (1)	
"	198	606		2	9,6 = 15	1	25% (1)	re-washed; 2 chiffons
"	199	612		1	9	1	50% (1)	
4-6-18	200	605		2	8,11 = 19	2	25% (1)	Had to get re-washed; 2 chiffons
"	201	606		2	6,6 = 12	2	25% (1)	rewashed; 2 chiffons
07-6-18	202	467		2	8,10 = 18	1	25% (1)	
"	203	607		2	6,8 = 14	1	25% (1)	
"	204	613	"	2	6,10 = 16	1	25% (1)	
8-6-18	205	633		2	7,8 = 15	1	100% (1)	
"	206	614		2	12,8 = 20	1	25% (1)	
09-6-18	207	506		7	10,8,9,8,9,4,10 = 58	1	[illegible]	→ 25% (1)
"	208	642	"	2	9,9 = 18	4	[illegible]	→ 12.5% (1)
"	209	608		2	6,6 = 12	1	12.5% (1)	
"	210	469		2	10,3 = 13	1	25% (1)	
13-6-18	211	609		2	10,12 = 22	1	[illegible]	→ 12.5% (1)
"	212	644	"	2	8,7 = 15	1	12.5% (1)	
"	213	643		2	10,8 = 18	3	12.5% (1)	
"	214	663		2	10,10 = 20		25% (1)	
14-6-18	215	603		2	6,6 = 12	1	25% (1)	

646

Figure 6.8: Flot log.

whose records may relate to each other through formal references among each table's immutable indexes (see Banning (2020: 49-51) for an overview on relational database structures). This enables users to query data across multiple tables or to update data in bulk or in tandem, as long as the relationships between tables' indexes are formally defined.

Digital databases run on database management systems (DBMS), software that provides a database's basic functionality. Users access a DBMS by issuing commands in structured query language (SQL) that specify certain actions. Common commands include creating new records with specified values, retrieving records that match specified criteria, updating records by replacing existing values with new ones, or deleting records from a specified table (Lock 2003: 89-93). Users can issue these commands through a variety of interfaces, including graphical, command-line or web-based application programming interfaces (API). In any case, all of this relies on defining and enforcing formal data structures (Banning 2020: 46-51; Contreras et al. 2021: 304-309). DBMS can be made to ensure that values recorded for particular variables are of a specified data type (e.g., integers, decimal numbers, text), are never left blank, relate to existing records in other tables, exclude certain values that are not anticipated or allowed, or match other custom criteria (Lock 2003: 91-93). User interfaces layer built around a database can also force users to choose from a pre-selected list of values to avoid minor inconsistencies in spelling and terminology (Kadar 2002: 78). Each valid SQL command is a self-contained logical statement that includes all parameters needed to do a particular action. If a command is not logically consistent or fails to account for all necessary parameters, the DBMS will not execute it. Databases are developed by first creating a formal data model, or schema, that identifies the variables, data types, indexes, relations between indexes, and rules of association between tables, and then populating this framework with data keyed in through user interfaces or uploaded using automated systems.[A164, A165, B19, B47, B48]

In other words, databases establish formal structure by integrating information that would otherwise be scattered across various files and whose relationships would be unclear or undefined and therefore unactionable. They serve to centralize data, relate the outputs generated by complementary streams of investigation, and ensure that the data are structurally consistent.[A6] The relational database model, which allows for the database to be expanded by adding new tables that refer to indexes in other existing tables, is particularly useful for these purposes since it enables different strands of archaeological analyses performed on the same sets of materials, and which

generate distinct datasets referring to the same things, to be created on the fly and integrated with existing work on an as-needed basis.[A6, A98, B49] Relational databases are great for drawing associations among entities in the "exploded" archaeological record, which archaeologists investigate using a variety of methods and techniques to produce a variety of perspectives (see Section 5.3.3).

A project's database thereby represents the progression of work performed on information and materials collected. It is custom-built, and uses conventions that are employed on a project-by-project basis. Practical decisions about the DBMS are often made "on the fly" or are derived through trial and error.[A165, A163, C44] Database managers are often learning this work as they go, and may assemble code and techniques published on various blogs and online forums. Archaeological database managers may struggle to reconcile the information presented by these disparate sources, and the products they eventually cobble together may not perform optimally as a result.[A165, A163] In addition, many decisions made in the design and implementation of a database are not adequately documented.[A87] As much as a database is a representation of the project, it is equally a manifestation of the technical skill and archaeological understanding of the person who created it.[C45] As such, it is very difficult to expand upon the work of others, and others who wish to expand upon earlier work may struggle to comprehend the decisions that went into the development of a particular database.

6.6 Managing digital repositories

Archaeological projects generate lots of digital media, with varying properties and functional value. There is an impetus to store and organize all of this information, and this tends to be done in a very ad-hoc manner that is consistent with archaeology's general tendency to use consumer electronics in an improvised fashion. Here I describe the norms and protocols that the archaeologists I interviewed and observed have established to manage their digital repositories and highlight various implicit priorities and assumptions that underpin these practices.

First, it is necessary to distinguish among several kinds of digital media that archaeologists create and maintain. Born-digital media, such as digital photographs, data visualizations, or other information objects produced through programmatic means, are cheap to produce and exist in abundance. Transcribed documents, such as spreadsheets containing information copied from physical recording sheets or input

from direct observations, are also kept and continually updated. Digital facsimiles of physical media, such as scans of recording sheets and field journals, serve as redundant and accessible backups of their physical counterparts.

Archaeological projects make a concerted effort to centralize their digital repositories. For instance, Case A's digital repository took the form of a single portable hard drive, while Case B relied on a unified drive hosted by a commercial cloud storage service.[B50, B51] These are separate from, but related to the database; while relational databases contain series of formally-defined and explicitly-related observational records, these repositories contain files whose contents have been input into the database (e.g., spreadsheets that specialists supplied after they completed their analyses), files associated with database records (e.g., photographs recorded in a photo log), or files that supplement or contextualize the information contained in the database (e.g., scans of field journals).[B50]

Digital repositories organize files in hierarchical file systems, which are ubiquitous in modern personal computing environments. Files are stored in a series of nested directories (also known as folders) that make it easier to organize and locate information.[B50, C46, 8] Directories represent abstract entities meaningful to the user, and the files contained within them are about or correspond with that entity. The entities represented in file systems maintained by archaeological projects' typically mimic the physical and conceptual distribution of archaeological materials and knowledge generated by a project.[B50, C46] For instance, Case A's digital repository has top-level directories for survey and excavation; the excavation contains sub-directories named for each trench, each of which contains all the information collected in the field that pertains to them, including spreadsheets, scans of all recording sheets and field journals, and photographs that are organized and labelled according to the excavation units they capture (see Figure 6.9). Other top-level directories are named for various specialist domains and contain documents that were generated under their purview. These may be subdivided on the basis of the particularities of the methods employed. For instance, Case B maintains a directory for photogrammetry, which is sub-divided by the object being represented; each has a file that contains the final 3D model, as well as a sub-directory containing all the photographs used to generate the model.[B50, B52]

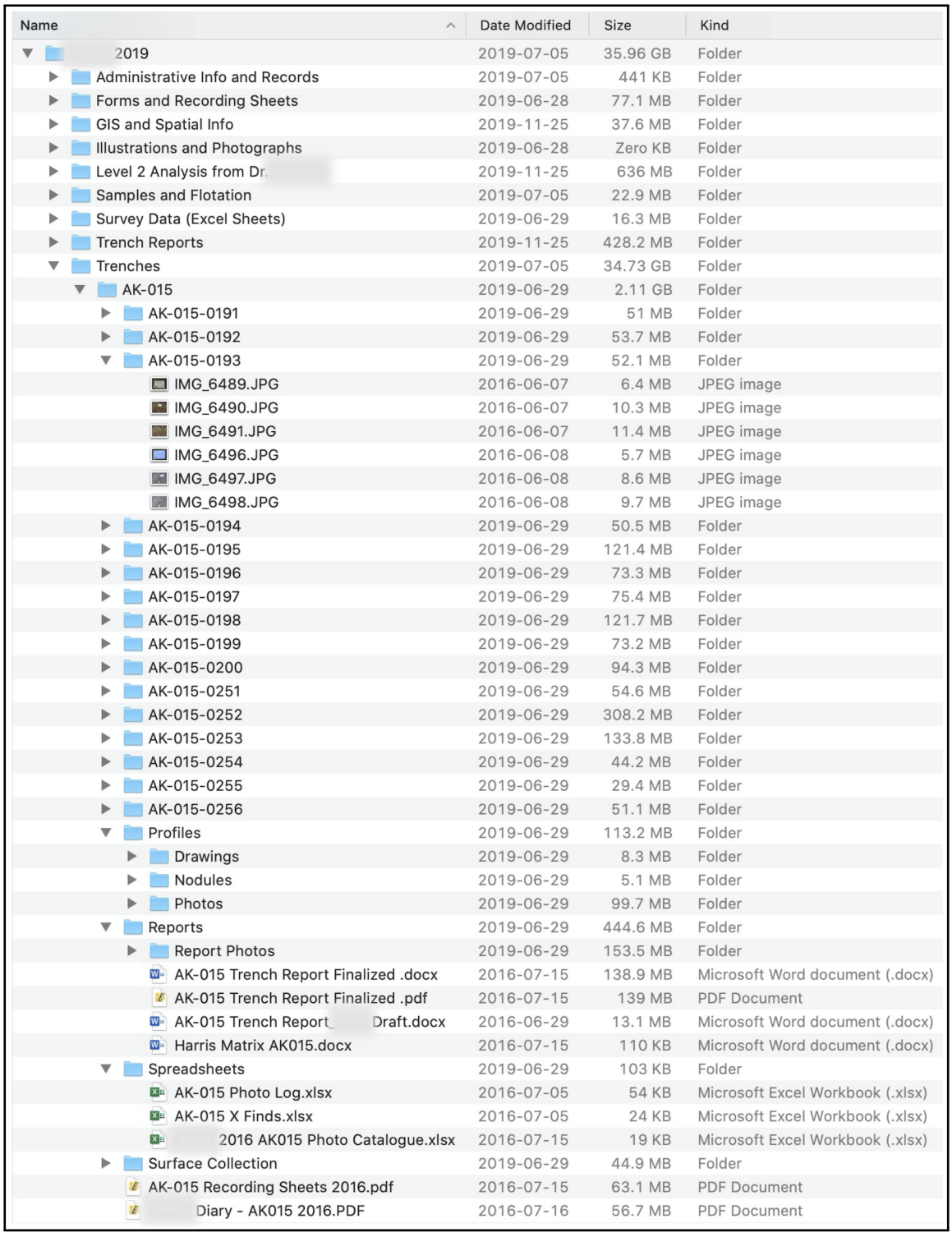
8. The file system is an abstraction designed to differentiate information stored in unified magnetic storage. They operate by separating data into pieces called files and assigning each file a unique name (its path relative to a root directory), so that the data can easily be isolated and identified.

It is common to apply a consistent naming and sub-directory structure for each entity in a set. For instance, the folders for all trenches in Case A's digital repository are all normalized, and each contains a basic set of files and sub-directories whose names are consistently formatted (see Figure 6.9). These names correspond with the project's entity-naming protocols, which refer to trenches, excavation units, participants' names, and various other entities in the database, on recording sheets, and in written reports. The digital repository is thus compatible with other elements of the project's information infrastructure by virtue of common adherence to internal standards and protocols.[B50, C46]

A project's centralized repository assembles the products derived from the distributed efforts of many contributing individuals. Trench supervisors are responsible for maintaining their own trench-specific repositories, and use their own laptop computers throughout a field season.[C47] As they complete work on an excavation unit, supervisors file their records locally and send the photos and recording sheets to the database manager, who then integrates these records into the database and the file system.[C48] Some information, particularly information that pertains to trenches as a whole (i.e. final trench reports and scans of section drawings), are only typically completed towards the end of the season, and the last week of fieldwork involves more intensive coordination between trench supervisors and the database manager to ensure that all records under their purview are complete and accounted for.

Only the final or most up-to-date versions of each trench report or spreadsheet are valued, but older iterations or drafts may be maintained in a separate backup directory or held by contributors on their own computers. It is common, but not required or sanctioned, for contributors to maintain copies of their work after submitting them to the project; digital storage is cheap and abundant, and contributors are not charged with actively maintaining these files, so simply having copies on hand involves no substantial investment.[C49] Files are typically transferred between contributors' and the database manager using USB thumb drives, which are handy in fieldwork settings that lack stable internet connections. Thumb drives tend to become cluttered with files, and are more susceptible to being damaged, lost or having their files erased or corrupted; they serve as temporary media for data transfer, and have their contents wiped so that they may be reused the following season.

The projects I engaged with claim ownership over the central digital repositories they maintain. Full access is limited to project directors and database managers, and



Name	Date Modified	Size	Kind
2019	2019-07-05	35.96 GB	Folder
Administrative Info and Records	2019-07-05	441 KB	Folder
Forms and Recording Sheets	2019-06-28	77.1 MB	Folder
GIS and Spatial Info	2019-11-25	37.6 MB	Folder
Illustrations and Photographs	2019-06-28	Zero KB	Folder
Level 2 Analysis from Dr.	2019-11-25	636 MB	Folder
Samples and Flotation	2019-07-05	22.9 MB	Folder
Survey Data (Excel Sheets)	2019-06-29	16.3 MB	Folder
Trench Reports	2019-11-25	428.2 MB	Folder
Trenches	2019-07-05	34.73 GB	Folder
AK-015	2019-06-29	2.11 GB	Folder
AK-015-0191	2019-06-29	51 MB	Folder
AK-015-0192	2019-06-29	53.7 MB	Folder
AK-015-0193	2019-06-29	52.1 MB	Folder
IMG_6489.JPG	2016-06-07	6.4 MB	JPEG image
IMG_6490.JPG	2016-06-07	10.3 MB	JPEG image
IMG_6491.JPG	2016-06-07	11.4 MB	JPEG image
IMG_6496.JPG	2016-06-08	5.7 MB	JPEG image
IMG_6497.JPG	2016-06-08	8.6 MB	JPEG image
IMG_6498.JPG	2016-06-08	9.7 MB	JPEG image
AK-015-0194	2019-06-29	50.5 MB	Folder
AK-015-0195	2019-06-29	121.4 MB	Folder
AK-015-0196	2019-06-29	73.3 MB	Folder
AK-015-0197	2019-06-29	75.4 MB	Folder
AK-015-0198	2019-06-29	121.7 MB	Folder
AK-015-0199	2019-06-29	73.2 MB	Folder
AK-015-0200	2019-06-29	94.3 MB	Folder
AK-015-0251	2019-06-29	54.6 MB	Folder
AK-015-0252	2019-06-29	308.2 MB	Folder
AK-015-0253	2019-06-29	133.8 MB	Folder
AK-015-0254	2019-06-29	44.2 MB	Folder
AK-015-0255	2019-06-29	29.4 MB	Folder
AK-015-0256	2019-06-29	51.1 MB	Folder
Profiles	2019-06-29	113.2 MB	Folder
Drawings	2019-06-29	8.3 MB	Folder
Nodules	2019-06-29	5.1 MB	Folder
Photos	2019-06-29	99.7 MB	Folder
Reports	2019-06-29	444.6 MB	Folder
Report Photos	2019-06-29	153.5 MB	Folder
AK-015 Trench Report Finalized .docx	2016-07-15	138.9 MB	Microsoft Word document (.docx)
AK-015 Trench Report Finalized .pdf	2016-07-15	139 MB	PDF Document
AK-015 Trench Report Draft.docx	2016-06-29	13.1 MB	Microsoft Word document (.docx)
Harris Matrix AK015.docx	2016-07-15	110 KB	Microsoft Word document (.docx)
Spreadsheets	2019-06-29	103 KB	Folder
AK-015 Photo Log.xlsx	2016-07-05	54 KB	Microsoft Excel Workbook (.xlsx)
AK-015 X Finds.xlsx	2016-07-05	24 KB	Microsoft Excel Workbook (.xlsx)
2016 AK015 Photo Catalogue.xlsx	2016-07-15	19 KB	Microsoft Excel Workbook (.xlsx)
Surface Collection	2019-06-29	44.9 MB	Folder
AK-015 Recording Sheets 2016.pdf	2016-07-15	63.1 MB	PDF Document
Diary - AK015 2016.PDF	2016-07-16	56.7 MB	PDF Document

Figure 6.9: File system maintained by Case A.

anyone who wishes to use the information they contain requires permission from by directors.[B53]

6.7 Digital curation and preservation

Digital archives hold a crucial role in the development of open science by extending the functional value of the information that archaeologists have produced over intensive, years-long efforts, and by serving as repositories that scholars may access to reuse datasets for synthetic analyses (Moody et al. 2021). My work corroborates the established view that digital archives are generally seen as services responsible for cleaning, organizing and documenting heterogeneous data in ways that make them amenable for use in secondary research contexts (Kansa and Whitcher Kansa 2013; Moody et al. 2021; Schmidt, Thiery, and Trognitz 2022).[C50, C19] They are thus positioned as key interlocutors between those who produce information through primary research efforts, and those who wish to extend these materials' functionality beyond the project's original scope (Moody et al. 2021). While digital archives' role in data reuse is often touted as their primary function and benefit (specifically by digital archaeologists who rely on them for synthetic or derivative research; see Section 2.3 for further discussion), project directors consider this a secondary concern.[C19, A166] Professional data curation services do not require that data be made openly accessible and, in fact, they manage accessibility of materials by various potential stakeholders. This includes imposing restrictions on access.[C19, C51, C52]

Digital archives often employ professional archivists and have developed systems and protocols that enable them to perform these delegated tasks at scale. They are usually partnered with universities or research centres that also provide institutional support that enables them to commit to preserving research data over the long haul.[C53, C54, C55] By paying digital archives to curate their data, archaeological projects delegate responsibility to sanitize, document, preserve, and distribute their data to dedicated experts who are committed to these tasks. Depositing data in a digital archive may also satisfy projects' commitments to funding agencies, who often mandate that funded projects plan for proper and long-term care of their research materials, which usually includes ensuring that all data are publicly accessible.[C56, C34] Altogether, digital curation services enable archaeologists to move forward with new projects without having to worry about the state of their prior work.[C57, C55, C58]

This concern with cleaning, documenting and preserving data orients popular

imagination of digital curation as technical work that is concerned with overcoming fundamental barriers that inhibit access to and utility of data stored using digital media. For instance, to illustrate recent work that exemplifies what they do at the data service that curates the information that Case C compiles, Amelie recalled a week-long effort to retrieve information stored on a CD-ROM (the once-ubiquitous physical storage medium that is not commonly supported anymore), fix a corrupt database file, extract all the data from the database, and then re-format the data so that they conform to an updated data structure.[C59] Paul also recalled how student workers enter and edit data, and Ned discussed his contributions in fieldwork settings that involved setting up interfaces with the projects' databases and helping project participants perform data entry tasks.[C60, C26] All these practical actions bear clear, tangible and immediate effects, and involve personal engagement with the digital data apparatus.

But digital curation also involves long-term planning and strategizing, actions that archaeologists generally consider more theoretical and managerial in nature than what was just described. For instance, Paul, Leonard and Amelie describe the data model they use to manage the data from all projects associated with Case C in terms of principles and implications that pertain to the atomization of records, the extensibility of the repository's scope, and the role of the repository within broader systems of scientific knowledge production. These depend on software applications that cater to user expectations and bear little overt reference to the core vision that underlies the whole system. The data service as a whole is a system with many effective ends that are informed by a series of principle design decisions.[C61, C62] Partnerships between digital archives and university library services, which are forged during board meetings, through email exchanges, and through resource-sharing agreements, are also crucial for ensuring long-term preservation of research materials.[C63, C64] Moreover, working with digital objects, or performing any kind of software development that gives these services their tangible value, fundamentally involves participating in discourses that set the parameters concerning the transmission and manipulation of information across digital systems. Software development is simply the distributed internalization and application of technical specifications.[C65, C66]

And yet, the technically-minded aspect of digital curation is at the forefront of discourse on the subject. Perhaps this is because it is how digital archaeologists imagine how they access digital archives (i.e. through accessing the API, by working with spreadsheets and data frames, etc).[C68] The hacker aesthetic, combined with the in-

creased opportunities that participation in modern technoscience, which in turn draws from myths surrounding Silicon Valley entrepreneurship, affords, serves to fetishize the digital apparatus (Huggett 2004). It is also notable that this kind of work primarily deals with already-existing and completed datasets. These, as discussed in Section 2.2, are particularly amenable to extension through synthetic or comparative analysis by virtue of their perceived stability. On the other hand, the rather abstract plans devised through theoretical and managerial aspects of digital curation are difficult to square with the pragmatic and improvised character of fieldwork. As Paul deftly stated, fieldwork is a "pressure-cooker" environment and you "have to go into that environment ready to hit the ground running".[C9] This relates to the tension between proactive data-management strategies and improvised data-collection practices discussed elsewhere in this section (recording sheets and field journals; collecting and managing spatial data), which I characterize as conflicts between managerial and pragmatic impulses.

6.8 Summary

This chapter articulates various archaeological activities as sites of discursive negotiation, or points of convergence between participating agents who hold different perspectives and who are informed by their respective roles and experiences. Based on my observations of archaeological practice in action, I describe each activity's primary goals, the tools and practices involved, and how they fit into broader systems of knowledge production. More specifically, I draw attention to how each activity commits to certain notions and valuations of data.

6.8.1 Overview of archaeological activities

First, I compare the use of recording sheets and field journals, which are the primary means of recording archaeological objects and phenomena in fieldwork settings. Recording sheets capture formal data whereas field journals account for a more varied set of decisions and situated experiences. Despite the fact the information captured using recording sheets is more conducive to being integrated into digital data management and analysis processes, fieldworkers consider journals to be more honest representations of the archaeological record.

I then describe a few ways in which archaeologists capture visual media, including illustration, photography, and photogrammetry. I demonstrate how each means of

visual representation involves different sociotechnical arrangements, operationalizes human and non-human agents in different ways, and compares the different kinds of information that each medium effectively conveys.

I go on to document various tendencies concerning the collection and management of spatial data, with emphasis on the implications of implementing different data collection strategies bearing their own unique sociotechnical arrangements. More specifically, I compare the workflows that extend from use of low-tech methods (involving measuring distances using string, tape measures, and plumbobs) to use of theodolites, total stations, and DGPS systems, and highlight different means through which data are processed and integrated into broader information management systems.

Subsequently, I describe the series of steps through which archaeological materials are collected and prepared for analysis. I describe common tasks involved in separating materials based on their physical properties and provenance, and account for distribution of labour and agency.

I then characterize the maintenance of archaeological databases as a means of pulling information from across the project together into an integrated system. I describe how data models are conceived and expanded, and the challenges involved in documenting the decisions involved in database management work.

I account for how the three archaeological projects I researched accumulate digital files and organize them within digital repositories. Archaeologists organize these file systems in ways that reflect the distribution of archaeological work and ensure that the files can be found and accessed with ease. I also discuss issues concerning how people contribute to these repositories, what kinds of information is considered worth including, and how access to and ownership of these centralized systems and their contents is controlled.

Finally, I account for how archaeological projects curate and preserve their data over the long term. I describe the relationships between archaeologists projects and professional digital archivists, which bear their own distinct warrants and priorities.

As with Chapter 5, and as discussed in Section 4.2.1, the evidence I cite to account for discursive tensions pertaining to common archaeological activities is unevenly distributed across all my cases, due to the different kinds of activities I was able to observe in each case.

Since I did not observe any fieldwork pertaining to Case C, I rarely referenced this case in sections dealing with fieldwork-related activities, such as Section 6.1, Section 6.2, Section 6.3, and Section 6.4. Conversely, my work with Case C involved visiting the premises where their data are integrated and preserved, and this case is therefore over-represented in Section 6.7.

6.8.2 Archaeology as continuum of practice

This chapter highlights how various common archaeological activities mask a series of collaborative commitments between social worlds. I articulate how particular tools, media, and protocols operate as part of an extended continuum of practice, whereby people perform actions while accounting for prior decisions and anticipating future behaviours and attitudes. Accordingly, I frame archaeological data, which derive from practical actions, as discursive media that are influenced by and continue to affect other actions (see Section 2.4 for more background on this framing). In other words, I examine how data derived from various activities are prepared, documented, or modified to support their extended use.

I further demonstrate how certain tools, media, and protocols encourage information to flow along analytical pathways that are both supported by and reinforce professional and epistemic value regimes. More specifically, I show how various factors relate to a desire to frame archaeological records as formal entities produced in a seemingly objective manner.

I draw from activity theory to frame activities as series of tasks oriented around specific objectives, and which mobilize tools and people in relation to these goals. I show how both human and non-human agents are assembled in service of broader aims. People's agency is effectively limited by identifying with roles whose range of actions are limited by the role's prescribed responsibilities and a set of connections that limit the flow of data along particular pathways. In other words, I frame archaeological knowledge production as a distributed cognition system, comprising both people and non-human entities working in service of an established plan.

However, I also consider people's perspectives on why and how they act as they do. I found that while people do indeed serve a broader purpose, their actions are primarily informed by their own experiences and the highly specific circumstances in which they operate. When work is explicitly situated within a broader project-oriented system, rather than occurring on its own and then subsequently integrated,

it is very tightly managed. While people hold their own situated perspectives, the systematization of work effectively imposes a centralized set of goals and limits workers' abilities to develop and act upon their intuitive sense of how to proceed and to shape the kinds of outcomes that the project will arrive at.

The following chapter will extend this discussion by exploring some sociotechnical tensions relating to the production, maintenance, and use of archaeological data. More specifically, I will address the recurring theme of archaeologists' having to reconcile the subjective nature of their situated experiences with a need to record formal records for audiences disconnected from the original contexts of work, the inability to separate the management of labour and of data, and notions of ownership and control over information objects and the meanings they contain.

Chapter 7

Sociotechnical Tensions Relating to Data

The previous two chapters have identified common archaeological domains and activity spheres. More specifically, I highlighted the ways in which archaeological knowledge is produced through collective action and is mediated by various kinds of tools and organizational practices. I also demonstrated various challenges and tensions that emerge through incorporation of novel sociotechnical arrangements. This chapter discusses broader professional and epistemic implications relating to the observations made in the prior two chapters at the three cases I examined. More specifically, I address systemic tensions concerning formal and discursive representations of archaeological entities, the mobilization of archaeological labour, and concerns about data governance.

7.1 Formal and discursive representations

As discussed in Chapter 2, the notion of archaeological data is difficult to define. However, a dominant conceptualization of data has taken hold, one that is especially salient in the emerging field of digital archaeology: data consist of records that define formal relationships among archaeological entities and their observable features, and they are collated in a consistent manner, as motivated by a need, desire or warrant to render them comparable, typically through functional means of analysis (cf. Kintigh et al. 2015). Data, thus conceived, are typically manifested in tabular form, are decisive and concrete in their representation of discrete entities and their characteristics, and

are bounded by the methods used to produce them (Hacıgüzeller, Taylor, and Perry 2021). They are ambiguously considered both the products of disciplined analysis and the potential sources upon which similarly functional and predictable analytical processes may be applied (Huggett 2022: 274-276). This perspective imagines data work as primarily operating within digital research environments, and as mediated by spreadsheets, data frames, text editors, shell interfaces, and other systems commonly used by and associated with software development (Huggett 2004). Findings produced through formal means of analysis and that draw exclusively from formal representations are commonly held up as more rigorous and scientifically sound, relative to work more explicitly situated around professional or circumstantial experiences that render them more subjective. They are also seen as synthetic in that they apply rigid control mechanisms that make data conform to analytical workflows (Hacıgüzeller, Taylor, and Perry 2021; Batist et al. 2021).

I observed that formal data, which are characterized by being clean and tidy in arrangements that are more conducive to complex retrieval queries and patterned analysis, often originate as relatively messy analog records that are more amenable to fieldwork conditions. Through data-entry and data-cleaning processes, the values written down on paper recording sheets are copied to homologous and homogenous digital tables. However, fieldwork documentation is performed in ways that are responsive to that specific work environment and does not actively account for transformations that will occur down the line. Fieldworkers use imperfect spelling and grammar, use shorthand representations (e.g., double quotes to indicate same as previously iterated, informal abbreviations), deviate from controlled vocabularies, and cross out and re-write text (see Figure 7.1). According to Jamie, one of Case A's database managers, "something as trivial as, like, capitalization, or if someone writes a sentence on something and someone else is reporting it as like initials, you know, it needs to be in the same format so you can actually work with it".[A167] For automatic data retrieval and comparison to be effective, records must be consistently formatted, and so database managers must edit records while transcribing them into digital formats. The act of transcribing these written values involves significantly transforming or omitting what was originally recorded: words or values that have been crossed out or revised are not copied over; different handwriting or penmanship, which implies different authors or circumstances under which the records were made, are disregarded; and drafted versions of recording sheets, which are entirely re-written, sometimes never make their way to the database manager and are ignored.[A168] Moreover, some

elements that are difficult to represent as distinct database records, such as sketches that map the spatial distribution of entities, or Harris matrix diagrams, are excluded from the database work altogether. Acts of transcription thus involve a significant amount of transformation, including information loss.

The act of transcribing recording sheets often produces a sense of anxiety, as this work fails to meet the initial expectation of a smooth and frictionless workflow.[A84, A169, A170, A167, C69] Jamie, for instance, recognizes that "fieldwork, or field data is never going to be ideal, perfect, clean for data management and data analysis," but imagines an ideal situation as fieldwork being "a little bit more connected ... keeping the fact that you have to work with this stuff later in mind".[A167] She goes on to suggest that "implementing, as early as possible, or you know, as consistently as possible, some kind of standard" would help make data more amenable for analytical purposes.[A167] Similarly, Paul, who maintains the repository where Case C's data are compiled, considers it his job "to help [project directors] conceive of their research as data ... and helping them translate their questions into data, really, and making the data address their questions."[C29] These statements imply a perceived disconnect between projects' inability to plan and follow through on systematic data management protocols and their necessity for conducting proper research. Database managers who process data on a systemic level consider data entry a programmatic behaviour; the disconnect between idealized implementations of a project's data model and the reality of how things are actually recorded in the field forces some degree of acknowledgement that archaeological data are expressions of situated observations, which can be discomforting. Ensuring that field-recording practices are more standardized and consistent is one way of resolving this tension, albeit at the cost of dismissing alternative means of engaging with the archaeological record that do not conform to a narrow set of acceptable recording protocols.

We see this in the general treatment of field journals, which describe the gradual act of discovery whereby the trench and its constituent excavation units gain significance in relation to the project's overall aims (as elucidated in Section 6.1).[A142] Journal entries switch between atomic and descriptive characterizations of specific elements within the trench and more speculative associations that draw the trench within a broader understanding of the site as a whole. They exhibit greater flexibility than more formal records in that they may refer to any related entity or observation on the basis of the judgement and experience of the writer. In this way, field journals are discursive media that describe and discuss particular aspects of a project

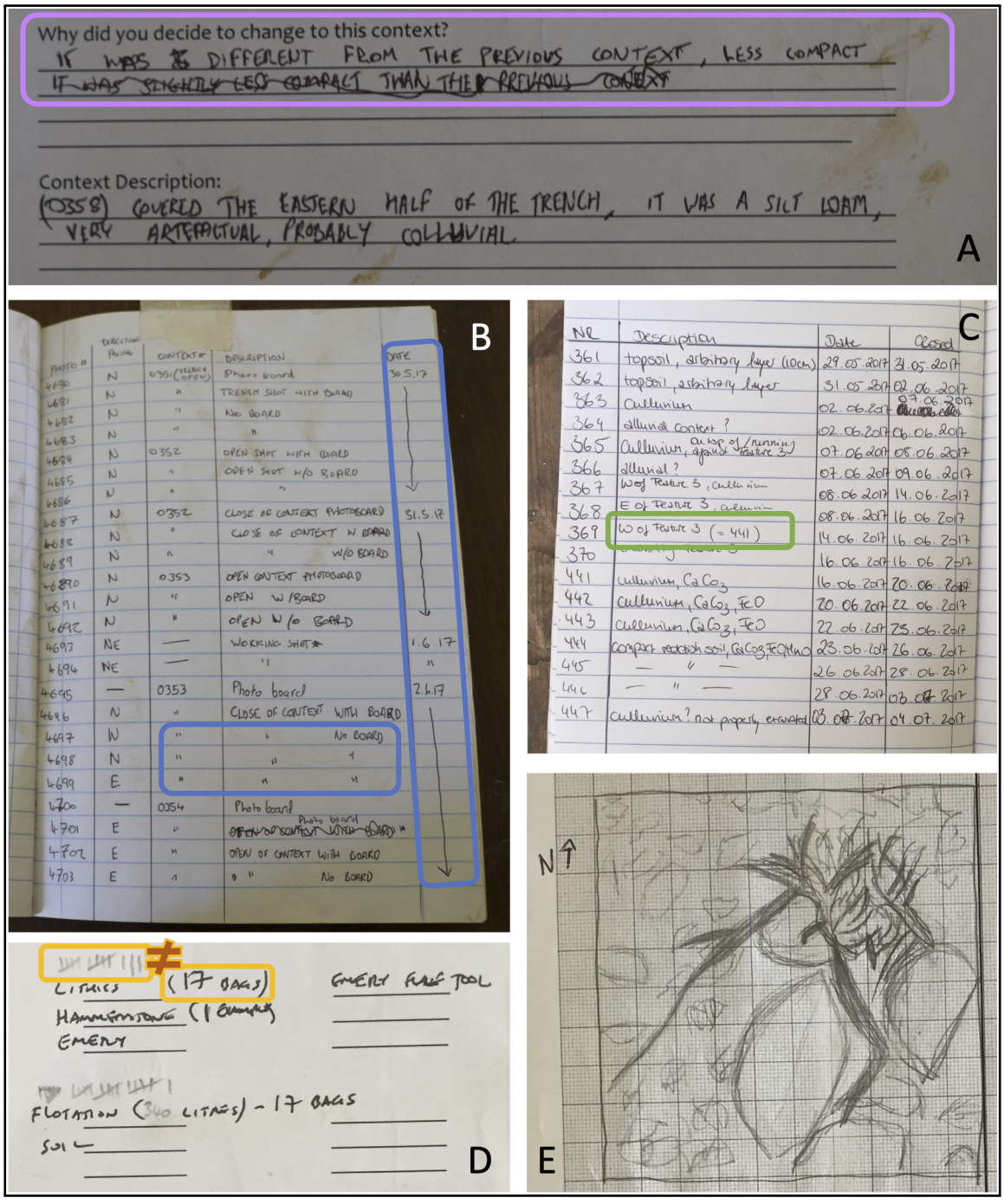


Figure 7.1: Instances of imperfect and idiosyncratic recording in fieldwork settings. [**A**] depicts an instance where text is crossed out; [**B**] depicts use of shorthand; [**C**] depicts internal cross-referencing; [**D**] depicts incongruency between tally marks and their sum; and [**E**] depicts a draft sketch of the base of a trench.

from situated perspectives, and contextualize and define an object's significance on the basis of particular experiences with it. In the cases I observed, field journals were never transcribed or codified into formal representations, or generally applied towards analytical tasks; they are used as mnemonic devices, to recall and reconstruct the mindset of the person who worked with the recorded material at specific moments in time.[A35, B34, B23, C70] This was exemplified by Liz's experiences collecting and integrating data from projects in which she has not participated: she recalls that "the very first thing I do is read the notebooks, because that's where you get sort of what their, . . . their sort of thought process throughout the whole thing, which makes it so much easier to then dive into the actual meticulous data".[B34] Reading field journals draws Liz into the project, enabling her to share in the experiences of archaeological discovery, thus establishing a kind of parasocial relationship that affords her a similar degree of understanding as an actual team participant in the original project might have had.

Obtaining access to field journals requires trust. Journals are internal records that are not published or shared publicly; Liz had to reach out to project directors to request access.[B54] In some cases, field journals contain information that may be lewd or seem unprofessional, and projects or certain individuals on those projects might not want to reveal such information. However as Eddisford and Morgan (2019) would argue, they shed light on the individual wielding the trowel. For instance, Barry recalls an excavator recording the Munsell colour codes for various bodily fluids, an activity that could impact his professional reputation.[B54] Barry also identified professional tensions that emerged upon the death of the director of a historically impactful archaeological project that had served as a venue where many very well known archaeologists were trained during their formative years. The late director's successor mandated making all field journals openly accessible alongside all other records, in compliance with still-emerging open-data standards and expectations.[C71] Many former participants objected to this, and the conflict nearly led to litigation. Barry never stated a specific reason for this contention other than the general sense that publishing these old records broke an unspoken professional courtesy, and would violate a trusting relationship between archaeologists and their late mentor.

Sometimes, trench supervisors elaborate on their written accounts of archaeological discovery as recorded in field journals during site tours, regularly scheduled events whereby the whole team goes around the site to learn what is going on in each trench. When the team arrives at a trench, its supervisor describes its prin-

cipal features, typically in a fashion that recalls the work and decisions involved in its exploration.[A171] Usually, the project director or finds analysts supplements this account by making interjections or rebuttals, helping to situate the trench in relation to broader project-wide narratives.[A171] Site tours are informal and are never recorded, but convey a great deal of information to listeners. Tours use imprecise language and refer to things whose meanings may not be well understood outside the project team. For instance, members of Case A often refer to the "red shit," which signifies a layer of red clay that appears throughout the site, and which nearly all excavators have had to struggle with.[A171] Project directors like to give these tours to visiting scholars, notable guests, and new project participants so that they can get a better understanding of what is going on in the site, rather than being limited to what's published in a paper or report.[A122, A124] For instance, Basil was eager for a visiting consultant to see the site and its material first hand, since the unique conditions under which the archaeological materials were preserved made them particularly difficult to record in a manner would convince a reader about their specific characteristics.[A122, A124]

Tours are typically given in ways that are amenable and responsive to particular visitors' experiences. For instance, tours for visiting archaeologists relate archaeological findings to discoveries made in other projects and with greater concern with greater professionalism. By contrast, the tour given to a team of new trench assistants at the start of a season emphasizes common points of reference to orient them for work during the season and to motivate them about their work environment.[A172]

These less formal ways of representing the archaeological site and the findings made there are either not recorded at all or are not reduced to components that are amenable to integration in a formal database (cf. Hacıgüzeller, Taylor, and Perry 2021). They occupy an entirely separate data stream than formal records, yet have value as interpersonal and richly contextualized accounts of a project's findings that would be impossible to present adequately through formal means alone. This conforms to project directors' recognition of the importance of narrative when they write up archaeological findings. Such writing necessarily involves situating work in relation to warrants, constraints, and the value the project adds to the current state of knowledge.[A173, A174, A175, B32] Moreover, the fact that scholarly papers are authored by the people most familiar with the objects of concern, rather than simply presentions of facts about the world, bolsters the dialogical aspect of presenting findings and enables those making use of published data to ascertain the quality of the work on basis of the authors' reputations (Faniel et al. 2013: 301).[B1]

7.2 Making data and labour more generic

Despite the fact that records of archaeological findings take various forms and arise through various processes, the formal conception of data and data work dominates discourse on the subject. Projects experience pressures to render observations in ways that are amenable to formal and functional analysis, which in turn mandate rigid and decisive data collection processes to instill confidence in the stability and evidentiary nature of archaeological data.[A176, A89] A particular kind of analytic process thus comes to dictate the conduct of other aspects of work, and involves reducing the interpretive agency of actors involved in all aspects of the data's constitution and processing. This impacts the social and professional arrangements of archaeological projects, contributing to the perpetuation of professional norms and the development of important skill-sets (practical hands-on skills, and interpersonal and collaborative skills).

For instance, Ben, a new trench supervisor, knew that the materials he collects and records would be analyzed through some formal processes but had no idea how, or what kinds of insights might be gleaned from them.[A107] Despite his burgeoning knowledge about the materials coming out of his trench, obtained through his fieldwork and his participation in formal lithics-analysis classes, his insights were not valued since they are not made part of a systematic apparatus geared towards publication. He considered this normal and acceptable on the basis of how he recognized his own role in the broader epistemic process.[A107] Theo similarly downplayed his interest in the meaningfulness of archaeological materials. He enjoys browsing the Archaeology Data Service archive during his breaks to see what was found at other nearby sites, "just out of curiosity".[A56] Moreover, Theo proclaimed that "I don't write up sites, I just dig holes", thereby explicitly distinguishing himself and other excavators from a world of professional scholarship, where analysts systematically examine archaeological materials and synthesize a valued knowledge object in the form of a published report or article.[A54]

Similarly, in cases where data entry is still manual, it is typical to delegate this work to relatively unskilled workers, specifically undergraduate research assistants. Howard, who oversees data entry work for Case C, claims that people who know less about the original contexts of data generation do a better job at transcribing data from paper to digital records. Howard said that he "had some students with more field experience or more training who basically come with certain assumptions

which may or may not be correct. And often those that have just a bit of experience ask the right questions".[C72] In other words, Howard acknowledges that data entry produces higher quality outcomes when students do not overthink things and cede responsibility for key decisions to supervisors. At the same time, Paul relies on students from each project that uses Case C to enter data on the project's behalf so as to ensure that project directors have greater control of their systems, and not for any interpretive benefits.[C73] Similarly, when discussing a project that integrated data from multiple sources, George distinguishes key authors who interpret findings from the synthetic dataset from those who simply contribute data without adding any of their own insights.[C74] In either case, the technological platform subsumes all prior acts as part of its workflow, with the ultimate goal of accounting for all information in a particular way. Interpretive agency is transferred from fieldworkers who must decide what to record and how to record it to the designers of systems who implement the rulesets in consultation with project management. In other words, fieldwork and data entry are subsumed into the domain of the database apparatus, and fieldworkers and data-entry workers lose their identities as actors in their own independent domains, capable of their own discursive processes.

It is notable that fieldworkers and database managers alike often perceived this as a welcome development. In either case, it enables them more effectively to fulfill the roles that they imagine themselves as having, fieldworkers' roles as sensory entities, and database managers' roles as purveyors of frictionless and value-neutral interfaces (see Section 5.2.5 and Section 5.4.2, respectively). These imaginations of their own roles may be ways of coping with a sense of epistemic unease that these workers feel unable to confront or articulate. By isolating their roles, they willingly abdicate responsibility for any disconnect between what they record and the results of extended analytical findings. Instead, this possible disconnect falls under the purview of analysts and project directors, who situate data as part of broader disciplinary narratives through acts of writing and publication.[A16, A17, A54, A106, A169, A173] This corresponds with the general lack of interest in or acknowledgement of the epistemic implications of the post-postprocessual turn, highlighted by Lucas (2019) and Huggett (2022).

As noted in the prior section, this also results in prioritization of archaeological materials as formally structured and abstract entities, devoid of character in their own right and always perceived as specific instances of a more general class. The generic-ization of labour and of data are not unrelated; the only person who can recognize a thing as meaningful is someone who is capable of granting it meaning. This is ex-

emplified by my observations of work performed by trench assistants, who essentially serve as unskilled labourers who are shuffled around a project to perform menial tasks that, almost exclusively, concern materials that have not yet been assigned archaeological character. For instance, cleaning artefacts and performing preliminary artefact sorting, flotation, or heavy-residue sorting involves working with mere matter, separating dirt and rock from potential anthropogenic entities, broadly construed. Those involved in this type of work prepare materials for analysis that others will perform, namely specialists (see Section 6.4). Similarly, trench assistants move sediment and rocks out of a trench, but it is up to the supervisor, who is responsible for recording the significance of these materials, to make meaning out of them. Trench assistants are cast as mere sensors, whose identifications of a thing, if taken seriously at all, are based on the character of shapes and textures they encounter, and not on any underlying archaeological theory or model. Their interchangeability, owing to the limited expectations made of them (simply responding to prompts), renders them invisible and removes any potential for imagining data collection as discursive and situated. The observer's role is to act without thinking too much, especially regarding how the material may fit within broader narratives. Moreover, the data-recording system, being a non-human and distributed entity, is not considered to hold a situated perspective, despite the fact that it was designed with implicit assumptions and affordances. Interpretation is thus pushed off to others who are not as present at the site, and whose distance from the archaeological encounter provides a kind of freedom to take the data at face value, rather than to grapple with their discursive origins. This contributes to a sense that so-called "data-driven" analysis generates new knowledge synthesized from a series of objective facts derived from generic, predictable, and protocol-driven sensing devices (cf. Huggett 2022). Archaeological information infrastructures are thus designed to enable the appropriation of direct observations by those with the means of extracting more meaningful value from them.

7.3 Appropriating and extracting value from data

Archaeological data are commonly referred to as being owned or controlled by individual people and by collective entities such as projects or workers associated with a particular specialist domain. Data have value as resources that form the basis for publishable research outputs. This has clear implications for how power is distributed through a project and across the discipline.

As elucidated in Section 5.1.3, project directors in the three case studies, as the individuals who obtain funding and research permits and who are most deeply invested in the project, assume control over all things that occur and all products derived under the project's purview. Directors establish the recording protocols and oversee the installation of information management systems for storing and organizing all the project's data.[A6, B50, B53, B9, C11] Moreover, directors establish projects' organizational structures and grant privileges and responsibilities to individual participant. These in turn carry norms and expectations regarding who controls a set of archaeological materials and the data derived from them, and the rights to profit from their analysis and publication.[A5, B1]

To be clear, producing research outputs, especially peer-reviewed journal articles, is a primary motivating factor for all senior members of archaeological projects. Published articles are where findings are laid out for the archaeological community and the general public, and where the value of years-long research projects is demonstrated.[B32] Aside from being a core aspect of scholarly work, publishing is crucial for advancing one's career, for establishing one's reputation as a serious scholar, and for making a living as an academic. Basil, for instance, recalled his role as a publishing member of a rather prestigious archaeological project while outlining his academic trajectory to me.[A177] The criteria for deciding whom to include as a co-author on a publication are somewhat vague, but George, Rufus and Basil identify having a creative role as a significant factor.[A173, B55, C74] In general, if a paper includes material under a specialist's domain and benefits in a substantive way from the specialist's analysis, then that specialist will be a co-author. Sometimes, a senior assistant will also be a co-author, depending on their degree of involvement. One notable aspect is that these individuals, in their roles as specialists, connect their work with work that occurs outside the project. This lies in stark contrast with other project participants, such as fieldworkers and database managers, whose jobs do not involve engaging in broader discourse outside the scope of the project; these individuals relate their work only to other work that occurs within the project, such as comparisons among trenches across the site. However, they are sometimes, though rarely and often collectively mentioned in a paper's standard acknowledgements section. Moreover, while somewhat arbitrary, there is an upper limit to how many individuals may be listed as authors on any given publication; broadening the criteria for authorship dilutes the value of being a listed author.[C74] More specifically, this would undercut the value of holding a scarce resource, namely a dedicated set of archaeological material and data derived from

them on which to base one's analysis.

Consequently, the allocation of archaeological materials to particular people is a crucial aspect of power relations within archaeological projects, in light of the imperative to publish. While directors control all the material within the project, they assign particular parts of it to specific people, with the expectation that they will perform analytical labour in exchange for a piece of the creditable research outputs.[A5, A6] Once records about this material have been created, they jointly belong to the project, its director, and the domain supervisor. Similarly, records derived from fieldwork are said to belong to fieldwork supervisors, albeit on a less equal footing, and as a subsidiary of, the project as a whole.

The relative independence of specialists and their ability to situate their work in relation to a broader set of experiences outside the project that few other project members have, gives them a greater degree of power in relation to the director, and situates them as colleagues. In contrast, fieldworkers' skills are somewhat more common. Owing to their common status as undergraduate students or volunteers, fieldworkers are not necessarily plugged into broader archaeological discourse that might elevate them to a status as core members of the archaeological community worthy of professional courtesy and attention. Moreover, their interpretive contributions are limited to comparisons between entities within the project's boundaries, and this limits their discursive range.[A107. A178, A54] Certain fieldworkers who have developed a deep sense of familiarity of the site, such as supervisors participating in their second or third season as members of the same project, may hold considerably more power than new members or volunteers since their knowledge derives from un-repeatable experiences. However, these experiences are difficult to communicate formally or extend to a more general discourse, and this again limits the potential range of their contributions to broader archaeological knowledge production. Trench reports, which present the facts of a season's fieldwork in a given area of the site, are one way of obtaining this knowledge in a manner that renders it more transmissible to other project members.[A179, B12] However, they remain internal and unpublishable documents. It is up to project directors to synthesize these reports and render the main highlights publishable for broader audiences.[A179, B12]

Project databases play a similar role for records created during fieldwork and for the results of various specialist analytical protocols. These records require cleaning, selection, and assembly to support the specific findings that the project's authors

wish to publish. For instance, at Case A, the first project publication only presented findings from a single trench that had been excavated over three years, and whose contents had been subjected to multiple forms of analysis.[A79] The data that informed this publication was scattered across multiple experiences, and the database served as a synthesizing device.[A89, A79, A180] Data management cuts across all project domains by virtue of projects' mandates to create a common data stream, that is, an integrated knowledge base that contains all findings derived from work that occurs at a particular site and by all personnel working under the project permit. The database thus imposes and reveals the power of the central project director as coordinator of all labour.

Additionally, data are rarely shared outside the project prior to publication; they are shared internally among project members, or externally only with individuals who are very close to the project and have a clear understanding that they should not share the data more broadly without the project director's permission.[A181, A182, B56, C75, C76, C77] Even with open-access mandates and among those who personally value the principles that underlie open science in general, data are made available after or as they are published by the team that produced them.[B56] This may partially be attributed to the time and effort invested in generating a dataset, and the assurances made to all publishing members that they would stand to benefit from their contributions through relatively exclusive publication.[A87, A182, C75, C76, C77] In this sense, open-data mandates have failed to de-centre project leadership from the collective effort of archaeological project management. Although it is not their primary aim, de-centering is an important aspect of fostering an open scholarly attitude. Moreover, open data's emphasis on data as formal representations, and its primary benefits being advertised as enhanced synthetic analysis that rely on seemingly objective data derived from predictable and genericized data collection processes, both serve to affirm the role of the database as a centralizing device and the implementation of recording strategies and workflows that bear clear affordances towards hierarchical modes of knowledge production, as described throughout this chapter.

7.4 Internalizing and resisting data managerialism

The trends discussed above, namely the prioritization of formal representations, the genericization of data and labour, and the roles that databases play as centralizing devices, all highlight the sense that archaeological data management is manage-

ment, and thus relies on managerial principles that enable strategic re-arrangement of agency from a distance. For instance, in establishing archaeological workflows, which are disciplined ways of working that ensure information is collected and organized in ways that are amenable for certain forms of analysis (which produce valued kinds of research outputs, namely reports based on statistical and spatial distribution of finds), it is necessary to control how information is collected, organized and processed. Accomplishing this involves modelling archaeological practices in abstract ways and implementing control mechanisms that ensure that the information collected in roughly textured epistemic environments (such as archaeological fieldwork) is rendered as smooth and discrete entities, as necessitated by the protocols used in digital analytical research environments.[A130, A138, A139, B40] This effectively renders various archaeological activities as actions in service of data management and analysis.

Modelling projects as abstract information flows is also convenient for organizing and presenting data. Because analytical tasks require that data appear discrete and objective, and accomplish this by placing distance between data collection and data analysis, modelling data collection behaviour as series of standardized and documentable practices helps reassure analysts that the materials with which they work resemble reality in some way.

Moreover, simplifying archaeological practices as generic information-processing activities serves to define agents and activities as discrete and concrete roles and behaviours. This influences perceptions of how archaeological data should be represented, organized and shared. For instance, they present a hard distinction between data collection and data analysis, whereby records of situated archaeological observations are stripped of contextualizing information pertaining to decisions made during the initial encounter. This is very commonly accepted as a normal and expected arrangement. These models also reify boundaries that were not really that strong to begin with; they try to make fuzzy roles and responsibilities more explicit and more sharply demarcated, and formalize informal relationships. In these ways, models are discursive entities that serve as suggestions for best practices. In describing their work practices, many of my informants identified "normal" ways of working as points of reference against which they compare their real experiences. These conversations and observations of how work was actually practiced revealed a dialectical experience whereby the institutional model influenced both how work is done and perceptions of how work should be done.

For instance, fieldwork relies on various habitual practices and organizational principles to maintain the integrity and meaningfulness of its physical and informational outputs, such as establishing site grids, and using labels and identification systems to maintain provenance (as discussed throughout Chapter 6). These involve forming material arrangements that structure the information collected, and organizing available labour and resources in ways that ensure that work is done efficiently and with adequate expert oversight. These protocols are fundamental aspects of archaeological projects that attempt to provide structure to the work and its outcomes. More specifically, they attempt to create conditions that are suitable for the collection and recording of archaeological evidence, to make it easier to communicate aspects of observed phenomena in formal terms, and to atomize tasks for temporal efficiency and for localizing expertise among specialists. However, these efforts are never completely effective. They make fieldwork seem like it is doing things in a reductive and objective way in order to meet scientific expectations and standards, which prioritize certain ways of engaging with the archaeological material. Seasoned fieldworkers know that their engagements with archaeological materials include biases and assumptions drawn from their own life experiences, but data managers are willing and eager to ignore these concerns.

This involves some tension between objectivist and interpretivist perspectives on the nature of archaeological knowledge and knowledge production. While the serious nature of these disagreements has profound implications for how archaeology should proceed as a discipline, Lucas (2019) notes that these tensions were swept aside around 20 years ago. In the absence of active discourse in what is commonly perceived as a tiresome debate, a series of technologies have been developed and implemented in archaeological research that warrant, and are finally beginning to receive, deeper critical reflection.

Despite the power that data management modelling has over how we think about various archaeological practices, archaeologists generally recognize the incongruity between models and reality and often refuse to comply with the models' expectations. In fact, despite attempts to bring extreme order to archaeological projects as concrete systems, the actual fuzzy nature of archaeological projects shines through, and often in ways that completely disrupt the carefully orchestrated workflows. These very visible breakdowns represent a counterpoint to Bowker's (1994) notion of "infrastructural inversion", the phenomenon whereby infrastructure becomes acutely visible during moments of disruption. In my case studies, however, the failures to control

archaeological knowledge production through the imposition of concrete structures reveal the discipline's fundamental epistemic values. The common cause and culture that archaeology has maintained, held as intuitive understanding of the bounds of epistemic behaviour (as per Knorr Cetina (1999)), resists attempts to atomize and workflow the archaeological process, and encourages a well-rounded and critical assessment of how individual tasks fit within broader systems of knowledge creation. In other words, the more things change, the more they stay the same.

Data management does not have to be this controlling. Ultimately, it comes down to a theoretical orientation that values pseudo-objective modes of analysis, as described and problematized by Lucas (2019) and Huggett (2022). The contemporary social, political and economic conditions under which we operate as archaeologists limit the range of possibilities that we are able to carry out, or even imagine carrying out (cf. Thorpe 2012; Zorzin 2015; Huggett, Reilly, and Lock 2018).

But even if people can not articulate what they want, there are hints that our current situation is less than satisfactory. For instance, project participants in my case studies resist changes to longstanding practices; they are wary when new systems involve learning skillsets that are orthogonal to their extant experiences, produce redundant workloads, or are imposed without necessary support.[A104, A139, C67] If new ways of working match archaeologists' current practices and allow them to perform the tasks that they value more effectively, archaeologists are more likely to accept change.[A104, C67] This is true for archaeologists in all roles: fieldworkers will tolerate new recording tasks as long as they do not interfere with digging, finds specialists will use novel recording strategies if it allows them to say something meaningful without disrupting their work, and project directors will seek ways to streamline logistical practices as long as the solutions do not interfere with regular operations.

Moreover, disconnects between what systems expect and what archaeologists desire account for several issues that those who develop information infrastructures commonly face. For instance, the lack of data reuse is a symptom of archaeologists' desire for more context from systems designed to remove human engagement from data sharing (cf. Faniel et al. 2013; Atici et al. 2013; Kansa and Whitcher Kansa 2013; Opitz et al. 2021; Sobotkova 2018; Huggett, Reilly, and Lock 2018; Fredheim 2020; Strupler and Wilkinson 2017: 294-295). The lack of novel or creative modes of analysis is due to the limited set of possibilities afforded by data constructed with targeted intent and integrated with little concern for reconciling different sampling

protocols. This forces would-be users of the data to pursue analysis only on variables that are common across all datasets, as "lowest common denominators". In addition, there is a lack of digital literacy among project members who are not expected to engage directly with digital systems, since digital work is framed as work that occurs either outside a project's normal scope, or after a project has been completed, and it is performed by people who are not-quite-archaeologists. We cannot adequately address these problems by perpetuating current norms and expectations regarding archaeological data and archaeological data work.

7.5 Summary

In this chapter, I describe some broader tensions relating to my observations and interpretations presented in the prior two analysis chapters. These findings relate to more systemic trends and relationships that concern the archaeological discipline as a whole. Consequently, they are more derivative from and less grounded in direct observations and elicitations, but nevertheless represent real experiences and implications.

I start by discussing how archaeologists balance their relatively rough, situated and uncontrolled experiences with an impetus to maintain formal records for analytical purposes. I demonstrate the challenges and frustrations that archaeologists experience as they transform records collected in fieldwork environments into more structured data. I also describe how information expressed in situated representations are not carried over when transcribed to more formal media, and I articulate the immense value that this lost information has in communicating archaeological observations and interpretations.

I then demonstrate how data collection and processing involves tight managerial control over labour. Since data are products of work, control over data requires control over the work from which they originate. Data management thus operates as a vector of project management, as all aspects of work are subsumed into the database apparatus. I show how interpretive agency is reserved for those who design the overarching systems through which data flows and labour is coordinated, and how the people who enact those decisions are made to act like generic and interchangeable tools.

I go on to describe the power relations involved in accessing information com-

mons. I identify certain individuals, namely project directors and specialists, as the primary benefactors of a project's information commons. They are distinguished from fieldworkers and database managers by the fact that they relate their experiences to a broader discourse that resides outside the project's scope. Fieldworkers produce internal and unpublishable documents that communicate their deep familiarity with the project for specialists and managers to use in their presentations for external audiences. I also discuss how open data mandates affirm the role of the database as a centralizing device that cut across the entire project, and entrench the roles of directors as authoritative project representatives and as key decision-makers.

Finally, I highlight the fact that the trends I highlight throughout this chapter are not inevitable outcomes of progress, but in fact represent a series of collective decisions, following a certain imagination of how archaeology should operate, now and in the future. I point out that these attempts to streamline archaeological work are often met with resistance, not necessarily by archaeologists themselves, but by the day-to-day pragmatic reality of archaeological work. I observed that archaeologists are already very effective at negotiating their encounters with archaeological entities and phenomena, and at deriving and communicating meanings among themselves and to others, and this shines through when workflows break down or complicate matters that could easily be done in more traditional ways. Simply put, this contributes to my view that archaeologists will ultimately adapt, absorb, or reject novel sociotechnical rearrangements based on how suitable they are to the reality of archaeological work, and not based on unrealized plans and promises. In the following chapter, I will relate these findings to broader efforts to develop open archaeological infrastructures.

Chapter 8

Conclusions and Future Directions

This dissertation articulates the sociotechnical systems that archaeologists develop and rely on to organize themselves and the information they produce, drawing from diverse kinds of evidence from three academic archaeological projects in the Eastern Mediterranean. My aim has been to demonstrate the social and situated aspects of archaeological data management, and, in particular, to frame data sharing as acts of collaboration and communication. I advance a pragmatic vision of science, which emphasizes local circumstances, experiences, and motivations as key factors that drive scholarly communication and participation within information commons.

I accomplish this by identifying the social worlds that archaeologists inhabit and demonstrating how people occupying different roles relate their experiences to common tasks and objectives. In Chapter 5, I highlight how people occupying different positions within project collectives converge on mutual interests and objectives, and how they coordinate their labour to produce valued research outcomes. Then, in Chapter 6, I examine various common archaeological activities as loci of collaborative action and as venues where value propositions concerning the relationships between data and labour are expressed and affirmed. Finally, in Chapter 7, I critically evaluate some broader systemic tensions that emerge from these arrangements, more specifically, by showing how various social and technical apparatus control labour and the information derived from it.

In this concluding chapter, I summarize how my key findings address each of the four research questions asked in this dissertation and propose a shift in the way we think about archaeological data management. More specifically, I argue that, in order

to ensure that data sharing produces effective results, it is necessary to account for and prioritize the social, pragmatic, and collaborative experiences that this entails.

8.1 Conclusions

Overall, I found that the management of archaeological data and of archaeological labour are deeply intertwined. The systems that archaeologists have set up to help collect, organize, combine, store, share, and reuse data all operate by controlling how people work. These technical infrastructures are far from being asocial entities, and in fact mask collaborative commitments, or norms and expectations that govern professional relations among participating agents. Moreover, the institutional and organizational structures that delineate roles and their corresponding rights and responsibilities, significantly influence how data are structured and made valuable. In this section, I summarize these sociotechnical dynamics, in response to the four research questions.

8.1.1 Roles and relationships

RQ1: How do archaeologists, who work at different points in time and space, and who engage with various kinds of evidence in a multitude of ways, manage to produce stable outcomes?

A key premise of my work is that all archaeological practices are inherently collaborative in that they involve picking up or producing meanings created by or for other archaeologists. Moroever, all archaeological work is also data work, since all practices involve transforming information from some prior media into another. This research question effectively prompted me to explore how archaeologists work in tandem to collectively produce information commons.

Archaeologists accomplish this by adhering to organizational structures to manage both labour and the data from which they derive. People take on specific roles, which frame their key responsibilities, what they are expected to produce, and how they should interact with other people. Adhering to these social structures gives the work credibility by ensuring that materials and information are collected, processed, and interpreted in a rigorous and disciplined manner.

Roles – rather than being fixed by official designations and titles – emerge actively from associations with tools, methods, or outcomes. In other words, roles are defined

by the activities that people are engaged in and the broader social relations that they entail, rather than by some intrinsic nature. People act in accordance with what is required of them to meet the activity's objective, and then internalize the character of this work as part of their professional identity. Roles are therefore delimited in relation to activities, goals, and domains of work that ascribe professional norms and expectations to the people performing a specific task.

While roles do not have definitive boundaries, and people flow into and out of specific roles, depending on the objectives that they are tasked with achieving and the circumstances that frame their operations, people are typically recruited to a project with explicit intent to perform certain activities. People are therefore placed within a certain situational nexus, which contributes to stabilizing their identities around the tasks that they are recruited to perform. Taking on a formal role means situating oneself within a project hierarchy and delimiting how one is expected to contribute to the project's information commons. In other words, internalization of roles is reinforced through adherence to data management and labour management protocols.

Additionally, I found that archaeologists are effectively objectified by way of their intrinsic association with either their objects of study or the tools and methods they employ. Someone who is closely identified with a tool, method, or object of study is therefore rendered as one component of an activity system or protocol. This has an effect of de-situating the experience of creating or transforming data, thereby removing perception of bias, and imbuing a sense of objective authority.

I also identified characteristic tools, methods, attitudes, and values associated with various domains of archaeological work, which include project management, fieldwork, specialist work, and data management. Each domain operates according to different professional expectations and comprise distinct sets of internal and external relations. A domain's unique character is derived from the environments in which it operates, its role within the project, the configuration of roles that enable it to serve its stated function, and how it relates with other domains. Project management, for instance, is responsible for getting all other work up and running. This entails legitimizing the project as an institutional entity, acquiring funding and permission to operate, supplying workers with tools they need to do their jobs, and establishing norms and protocols that ensure the knowledge that the project produces will be valued by the archaeological community. Conversely, fieldwork and specialist work process

materials and information in their own ways and produce reports for project managers to synthesize and publish, with support from the data management domain.

The relationships between domains have epistemic implications. For instance, as I describe in Section 6.4, fieldwork is distinguished from specialist work in that the former is responsible for rudimentary materials processing, and then pass those materials on to the latter who ascribe them with more intricate archaeological meanings. Fieldworkers and finds specialists alike consider the work involved in collecting and processing archaeological materials prior to in-depth analysis as involving little to no interpretive potential. This preparatory work is meant to support those who produce more legitimate specialized findings, which must be untainted by external or prior factors to be considered more credible. Those who simply process and clean materials and data internalize their roles as mere sensing and sorting agents, and downplay their work as involving mere material interactions rather than as transformative and creative processes. They value their capacity to contribute in this manner, since this leads to the eventual production of valuable research outcomes.

Despite the distinctions that emerge as archaeologists take on different roles throughout their collective work, a sense of solidarity still persists across all domains. All members of a project feel connected by their contributions to a common goal and by their diverse encounters with archaeological materials and phenomena of communal interest. The commons are bounded by the authority that a project has to investigate a site and the material assemblage contained within it, and by the community that it has brought together to carry out the task.

Still, as I articulate in Section 5.2.3, Section 5.5.1, and Section 5.5.2, the archaeological community is fluid and the boundaries between projects are porous. Students develop professional connections through their cumulative experiences as members of project collectives, and they perpetuate the professional norms and expectations that govern archaeological knowledge production as they continue along in their careers.

Fieldwork is particularly important in this regard, as it serves as a space and time that all archaeologists are expected to experience at some point. Experiencing fieldwork imbues an understanding that the information that archaeologists work with is generally rough, tentative, fluid, and flexible. While it may seem, in an abstract sense, that projects impose order on all the work that falls under their purview, experienced archaeologists know intrinsically that, in practice, this should be more accurately described as an *attempt* at order which is never fully achieved.

Archaeological projects, by virtue of being venues for social and collaborative work, are full of tensions and negotiations between all archaeologists doing archaeology in as many ways. Archaeologists' inability to square this understanding with the pressures to present their data as stable, disembodied, and asocial entities contributes to what Wylie (2017), Lucas (2019: 55-57), and Huggett (2022: 274-278) refer to as a sense of "epistemic anxiety". As I highlight in Section 5.4, this brings into focus the boundaries between archaeologists working with data, who share an intuitive understanding of what data's stability is mitigated by, and non-archaeologists, who are not as familiar with the realities of archaeological practice and who are more prone to take data at face-value.

8.1.2 Apparatus for managing information flows

RQ2: What is the nature of the social and technological systems that archaeologists implement to support distributed work, and what are their practical and epistemic implications?

Throughout this dissertation, and particularly in Chapter 6, I demonstrate that all archaeological practices involve some degree of data work, since they all produce or rely on information objects that encode meaning about an archaeological encounter. Data serve as media through which a continuum of practice emerges, in which archaeologists performing various tasks distributed across time and place produce and depend upon information objects that other related activities either expect as inputs or make as outputs. Archaeological activities thereby carry forward and transform meanings in what amounts to a curatorial process, which Dallas (2015) describes as simultaneous acts of interpretation and re-presentation. As people work on a particular activity, they reconcile their actions with prior decisions, and anticipate future applications that will be drawn from their outcomes. Archaeological activities are therefore loci of practical epistemic convergence, where meanings are negotiated in relation to communally-held objectives.

In my observations of archaeological activities and analysis of documentation practices, I note how information is passed along and valued throughout the continuum. I highlight how various individuals contribute to each activity in different ways, and how labour is operationalized to facilitate information transfer between activity systems. I document the sets of collaborative commitments that govern interactions among participating actors, paying close attention to the assumptions and value regimes that

practitioners elicit about their work and their relations with other activities.

In some cases, such as in Section 6.1, Section 6.2 and Section 6.3, I compare various means of achieving outcomes that the archaeologists I spoke with recognize as being somewhat similar. I disentangle these different outcomes and highlight how they actually differ in more fundamental ways than they initially seem. More specifically, I identify how different outcomes may afford different kinds of subsequent actions, and highlight the different kinds of agency that each individual activity participant brings to the tasks at hand. This was especially acute in cases where digital methods supplant non-digital variants. This involves re-arranging activity systems so that they are performed according to pre-planned decisions and procedures, using tools that support a limited range of action. These developments reflect certain values concerning archaeological data, namely that data should be collected under relatively controlled circumstances, using advanced technological equipment, with minimal human intervention, and with the potential to be tightly integrated with other information so as to facilitate analysis based on formal statistical methods.

Digital tools and methods ensure that data are managed according to well-defined parameters, and specifically in ways that are conducive to formal data integration. This enables analytical processes situated down the line to more easily ingest and use data. When designing workflows, managers decide what data to collect, how they should be collected, and how they should be processed, integrated and stored, in advance of data collection procedures. This involves defining participants' roles, as well as specific activity processes, according to discrete plans of action. Rather than trust the careful semantic negotiations that occur as materials and information get passed along the continuum of archaeological practice, and in particular, the interpretive potential of data collection workers and those who process materials and data, workflows maintain tight control over the whole process, from a characteristically managerial perspective.

In short, archaeological workflows ensure disciplined ways of working by offloading decision-making to managers. This ensures that work can be proceduralized according to predefined plans. They target outcomes, often way down the line, and prioritize efficiency in relation to these goals, whose outcomes benefit managers and analysts more than they benefit fieldworkers, whose interpretive agency is severely curtailed. As I observe in Section 7.2 and Section 7.3, archaeological data management, which primarily deals with abstract models, imposes control on relatively wild archaeolog-

ical experiences, in a way that supports short-term analytical outcomes but which ultimately misrepresents archaeological experiences. This reflects Suchman's (2007) distinction between plans and situated actions and Knorr Cetina's (2001) notion of objectual practice, which highlight the conflicting and complementary intersections between abstract managerial priorities and the actual experiences involved in carrying work forward. By rendering labour as a series of programmatic operations conducted by interchangeable components, database managers and project managers work together to impose control over relatively wild archaeological experiences, making their outcomes conform to standard models.

This corroborates reflections by other researchers, including Caraher (2019) and Thorpe (2012), who argued that workflows transfer interpretive agency away from fieldworkers – who must decide what to record and how to record it – to the system's designers – who implement the rulesets in consultation with project management. Fieldwork is thereby brought under the domain of the database apparatus, and fieldworkers lose their identities as actors in their own independent domains, capable of their own discursive processes. Data management systems therefore serve as vehicles through which project directors centralize their control over work being done throughout the project, and allow them to take ownership over, exploit,and redistribute the products of collective effort.

At the same time, as I articulate in Section 7.4, these systems are actively resisted. For example, Theo – who is Case A's eminent field director – exclaimed that the workflows effectively capture "bullshit".[A138] He humours the system and feeds it what it wants, but he knows that he knows more, and that he knows better, and that the things he experiences can not truly be captured on a recording sheet or in a database record.

8.1.3 Reconciling sociotechnical tensions

RQ3: How do archaeologists reconcile novel sociotechnical arrangements introduced by data management infrastructures with existing ways of working?

The compartmentalization of labour and work processes according to role, rank, and procedure within and across project domains has implications for how archaeologists collaborate. More specifically, this has the effect of delegating tasks to people in specific roles, internalizing what it means to be someone who occupies a particular role, and prioritizing adherence to formulaic processes over situated engagements with

objects and phenomena of interest. This involves changing the ways people work to suit restrictions or limitations imposed by digital workflows.

In some contexts, archaeologists are content to operate as cogs in the machine. For instance, in Section 5.2.5 and Section 5.4.2, I noted that trench assistants, data entry practitioners, and other relatively inexperienced members of a project embrace their roles as sensory entities, or as those who configure information to suit seemingly frictionless and value-neutral interfaces. This relieves these people – who are made to simply follow orders – of responsibility to resolve fundamental epistemic tensions, whereby the documents they produce fail to capture what they consider to be a more genuine understanding about the things they record. In other words, these workers willingly abdicate responsibility for any disconnect between what they record, and the results of extended analytical findings.

I observed a similar phenomenon in contexts of sharing data beyond the scope of a project. Just like with their own staff, in the context of open data sharing, project directors are instrumentalized and genericized in service of achieving broader synthetic findings. However, as I pointed out in Section 7.3, the project directors I spoke with expressed concern with this arrangement, arguing that they should be able to draw value from their data before they share them openly, citing the enormous investment they made to produce their findings. Moreover, while project directors acknowledge the potential that data sharing affords, they know that there is more to their projects than what the formal records are able to communicate – which echoes Theo's attitude, described above, but on a broader scale.

The data-sharing consortium that constitutes Case C recognizes this tension – between directors' apprehension to relinquish control, and the potential afforded by integrating data – and was founded as a forum where partners can leverage both their existing collaborative ties and the affordances provided by integrated datasets. The data they integrate under common schema are therefore backed by trusting relationships, particularly among project directors who already work together in the same region, and whose work is oriented by collectively-articulated goals. At the same time, George, who directs Case C, remarked that much of the data integration work would not have gotten done without the dedicated funds, and the commitments that obtaining those funds entails.

In all of these situations, productive, synthetic outcomes emerge from work oriented by a specified initiative, which is bounded by a small community of trusted col-

leagues, and, which is scaffolded by institutional power structures, which are masked by formal administrative and technical requirements.

8.1.4 Accounting for embodied decisions, experiences, and outlooks

RQ4: How do we account for the embodied decisions, experiences, and outlooks that contribute to the constitution of archaeological knowledge as we continue to develop large-scale data sharing infrastructures?

In situations where people were made to perform rote tasks according to some predefined protocol, I observed a general sense of ambivalence regarding how the outcomes of the work are picked up and used during subsequent work processes. As I documented in Section 5.2.5, trench assistants do not really care about doing paperwork, preferring to simply acknowledge their roles as diggers, and trench supervisors are similarly unconcerned about how their records are used, unless they are personally invested (e.g., through their graduate research). Moreover, project directors are ambivalent about how their data are used after publishing them online, and generally see their data as having potential value far in the future, for some abstract and undefined method that no one has yet even imagined (see Section 6.7). This may be partly due to the fact that data are published either piecemeal as analysis is performed, or as one big product after all work has finished. Under these circumstances, project directors are always involved as key authors, and have some reason to protect their stakes. When one feels that they have nothing left to gain from a product that they produce, they are comfortable handing it off to someone else and abdicating responsibility for maintaining and supporting it. In these cases where people hold limited personal investment with subsequent phases of work, a transactional relationship is preferable than one in which records producers are responsible for engaging in perpetual discourse with those who would request access to limited contextual knowledge.

This also relates with archaeologists' inability to adequately describe their data and the circumstances that contributed to their distinct character. More specifically, archaeologists struggle to describe or document how their plans differ from their actual actions (Opitz et al. 2021). Archaeologists who access published data want to know more about how the work was actually carried out in the contexts of their creation, but it is unclear how that information should be collected and presented (Faniel et al. 2013: 299-301; Atici et al. 2013: 676-677; Huggett, Reilly, and Lock

2018: 98-99). Informal means of communication certainly have a significant role to play. Formal records are lossy and ignore a lot of information that would otherwise be passed along in a social encounter. Formal records involve simplification, whereby individual experiences are flattened and made into a series of symbols that can be more effectively transmitted over transactional media (Hacıgüzeller, Taylor, and Perry 2021: 1722-1724). On the other hand, and as I articulate in Section 7.1, less formal means of communication encourage dialogue and enable people to share information that they would not feel comfortable putting into writing.

Recognizing the value of less formal means of communication will enable archaeologists to talk more openly about the situated experiences and imperfect decisions that informed their work. This will reorient data sharing as being concerned with documenting the decisions and circumstances that work actually entails, rather than documenting information objects and the plans that purportedly informed their creation.

I observed that the less formal means through which archaeologists come to understand the site are either entirely unrecorded, or occupy an entirely separate data stream than that which contains formal records. However, I found that people generally prize less formal explanations as more genuine than those expressed through formal records – such as recording sheets or trench reports. The examples I cite in Section 7.1 share a common concern with articulating situations and decisions, which participants consider to be best expressed informally, through field notes, conversations, and even inside jokes.

These means of communication can not be directly leveraged without direct communication, which gives the speaker the power to selectively imbue subtext, and contextualize the things that they are saying based on who they are communicating with. If we are to take these means of communication as meaningful and supportive documentation, we need to respect them for what they are, and recognize that their power is derived from their informality and non-universality.

This relates with the sense of apprehension that people experience when making their records openly available on the web, so that others may pick them up and use them without considering the contexts or situations of their creation, as I described in Section 7.3. We must take these social and professional concerns seriously, rather than dismiss them as selfish data hoarding.

One way forward may be to elevate and value the means through which informal communication is articulated. This may help make it easier for people to talk more openly about what happens within their relatively private workspaces, soften the boundaries, and extend the range of communal understanding.

8.2 Implications for practice and research

As discuss in Section 2.4, I consider archaeological data to be discursive media, or entities that mediate understanding among collaborating agents. Data therefore serve as communicative devices that enable perspectives and experiences to be shared across time, place, and social circumstances. In this dissertation, I sought to highlight the social and productive experiences involved in sharing archaeological data.

I rely on a variety of theoretical frameworks to strike a balance between a humanistic and object-oriented vision. In particular, I value symbolic interactionism, situated learning, situated cognition, and the original conception of social psychology that underpins activity theory, which share a pragmatic approach in that they account for the local circumstances of action and the sense of desire and anticipation that motivate and mitigate action as key factors that inform productive acts. These frameworks informed my understanding of how symbols serve as devices that mediate social interactions, and how these interactions shape and are shaped by social norms. Moreover, they contributed to my concern with objective-oriented action, whereby actors assemble and delegate systems, comprised of human and non-human actors, to satisfy their visions.

I appreciate how these frameworks enable me to raise the voices of practitioners themselves to document significant systemic concerns. Despite being limited to three cases exhibiting limited demographic range and methodological approaches, my observations, interviews, and analysis of documentation highlight key underlying assumptions and value regimes that govern how work should proceed, but which archaeologists have not yet critically evaluated. As people who do this work on a day-to-day basis, archaeologists are generally already aware of these factors on an intuitive level. I sought to empower archaeologists to pursue productive change by systematically articulating this latent knowledge.

This is particularly meaningful in our current context of increased reflection on and critical understanding of technology's role in our professional and day-to-day in-

teractions. This seven-year project has taken place at a significant theoretical and practical inflection point regarding archaeological applications of digital tools and media. Lucas (2019) notes a general lack of active theoretical discourse about archaeological data and archaeological applications of digital methods since the late 1990s. He explains this as deriving from a general unwillingness to engage in tiresome epistemological and ontological debates, which reached a crescendo during the early 1990s. Digital archaeology flourished during this time of rapprochement, as its practitioners perceived "data-driven" methods as pragmatic ways of side-stepping thorny theoretical concerns. However, the past decade has seen a recent uptick in theorization about digital methods and media, highlighting significant epistemological challenges, most of which concern re-situating archaeologists as actively involved in the constitution and management of data. Many of these are polemical articles or comprehensive yet opinionated reviews of digital practices (Huggett 2022; Caraher et al. 2020; Kristiansen 2014; Stobiecka 2020). However, some more empirically grounded work, including this dissertation, systematically evaluate professional practices relating to the creation, organization, analysis, and distribution of archaeological data (Batist et al. 2021; Hacıgüzeller, Taylor, and Perry 2021; Huvila, Börjesson, and Sköld 2022).

This reflexive discourse and the preceding rise of the seemingly atheoretical field of digital archaeology contribute to a sense of epistemic anxiety, whereby archaeologists must reconcile the notions that their data are both objective and decisive, as well as subjective and situated, in either productive or reflexive contexts, respectively (Wylie 2017; Lucas 2019; Huggett 2022). Increased day-to-day use of digital methods and media in all aspects of archaeology raised general attention to their limitations, and diminished the general sense that they necessarily produce more legitimate and stable knowledge. And yet, digital methods remain integral components of the archaeological toolbox, and still exhibit an authoritative aura, albeit shining a bit less brightly than before. Digital methods and media are not going away, nor should they, but archaeologists are now asking themselves how they want to continue using them, given increasing awareness of potential practical and epistemic issues.

My work directly grapples with these realizations. By adopting a broad notion of archaeological data that effectively renders all archaeological work as dealing with data, I consider digital and non-digital activities alike as practices in a general sense, which necessarily entail social, technical, and epistemic implications. Moreover, my findings are grounded on participants' reported perspectives and on my own obser-

vations of enacted activities, rather than on idealistic examples that one might read about in a textbook. I therefore account for the situated experiences of carrying out archaeological practices, including the constraints and affordances that contextualize, warrant, and impact their enaction. By treating decisions to implement digital practices as a pragmatic affair, involving trade-offs that one would make when making any kind of methodological decision, I ascertain what values archaeologists hold dear and their understanding of how the variety of paths forward available at their disposal will help them achieve their goals. Moreover, I consider what kinds of social relations that these practices entail are deemed professionally and epistemically acceptable, and how archaeologists deal with the challenges they raise.

Archaeologists have been sharing data for decades, inasmuch as they have always acted as collaborative agents involved in a collective enterprise. Data-sharing, even when it occurs under the label of open science, is not necessarily totally open or transparent, but is mitigated by social circumstance and professional norms and expectations. Notwithstanding the fact that not everyone has access to the web, knowledge of dominant languages used in science communications, or the ability to sort through and make sense of the deluge of invalid, outdated, or otherwise problematic information published on the internet, technical infrastructures generally ignore the social circumstances in which they are used. Simply uploading and downloading spreadsheets to and from a central server does not make the data productive, even when they are accompanied by formal metadata. I have already demonstrated how this results in a loss of understanding, and how people work around these technical infrastructures to obtain the undocumented contextual information that is not transmitted through formal protocols (see Section 2.3 and Section 7.1). People who work around these systems recognize that real, productive outcomes will derive from participating as members of a trusted community, whereupon they may gain access to the information that archaeologists cannot or will not share more openly. Consequently, truly productive synthetic work, even when it relies on these global infrastructures, is usually backed by more personal and community-oriented professional relationships, such as participating as a member of an archaeological project, institutional research centre, or informal collaborative network, or by fostering connections based on communal interest in particular methods, tools, or theoretical outlooks.

While there have been substantial efforts to develop and improve open-data infrastructures in a technical sense, archaeologists typically interact with these systems in a manner that supports social and collaborative action. These collaborative interac-

tions are where data reuse really happens. Open data infrastructures should therefore operate in support of these experiences, rather than identifying themselves as the epitomes of data sharing in their own right. By framing data sharing, whether it occurs among close colleagues or is mediated by open-data platforms among strangers, as a series of collaborative commitments, this dissertation highlights and re-prioritizes the broader social contexts within which we develop these infrastructures, thereby advancing a vision for open archaeology that is more true to the social and practical realities of archaeological research.

Bibliography

Adema, Janneke, and Samuel Moore. 2021. "Scaling Small; Or How to Envision New Relationalities for Knowledge Production." *Westminster Papers in Communication and Culture* 16 (1). DOI: 10.16997/wpcc.918.

Adkins, Lesley, and Roy Adkins. 1989. *Archaeological Illustration.* Cambridge, UK: Cambridge University Press.

Allen, David, Stan Karanasios, and Mira Slavova. 2011. "Working with Activity Theory: Context, Technology, and Information Behavior." 62:776–788. DOI: 10.1002/asi.21441.

Archaic Inquiries. 2019. *Alcoholism In Archaeology.*

Atici, Levent, Sarah Whitcher Kansa, Justin Lev-Tov, and Eric C. Kansa. 2013. "Other People's Data: A Demonstration of the Imperative of Publishing Primary Data." *Journal of Archaeological Method and Theory* 20 (4): 663. DOI: 10.1007/s10816-012-9132-9.

Banning, Edward B. 2020. *The Archaeologist's Laboratory: The Analysis of Archaeological Evidence.* 2nd ed. Cham, Switzerland: Springer Nature. DOI: 10.1007/978-3-030-47992-3.

Bateman, Jonathan. 2006. "Pictures, Ideas, and Things: The Production and Currency of Archaeological Images." In *Ethnographies of Archaeological Practice: Cultural Encounters, Material Transformations,* edited by Matt Edgeworth, 68–80. Lanham, MD: Rowman Altamira.

Batist, Zachary, Val Masters, Tiffany C. Torma, Michael Carter, Neal Ferris, Isto Huvila, Seamus Ross, and Costis Dallas. 2021. "Figurations of Digital Practice, Craft, and Agency in Two Mediterranean Fieldwork Projects." *Open Archaeology* 7 (1): 1731–1755. DOI: 10.1515/opar-2020-0217.

Beck, Anthony. 2000. "Intellectual Excavation and Dynamic Information Management Systems." In *On the Theory and Practice of Archaeological Computing,* edited by Gary Lock and Kayt Brown, 73–88. Oxford: Oxbow.

Beck, Anthony, and Cameron Neylon. 2012. "A Vision for Open Archaeology." *World Archaeology* 44 (4): 479–497. DOI: 10.1080/00438243.2012.737581.

Bell, Gordon, Tony Hey, and Alex Szalay. 2009. "Beyond the Data Deluge." *Science* 323 (5919): 1297–1298. DOI: 10.1126/science.1170411.

Benardou, Agiatis, Panos Constantopoulos, Costis Dallas, and Dimitris Gavrilis. 2010. "Understanding the Information Requirements of Arts and Humanities Scholarship." *International Journal of Digital Curation* 5 (1): 18–33. DOI: 10.2218/ijdc.v5i1.141.

Berggren, Åsa. 2012. "Comments on Matt Edgeworth: 'Follow the Cut, Follow the Rhythm, Follow the Material'." *Norwegian Archaeological Review* 45 (1): 92–94. DOI: 10.1080/00293652.2012.679425.

Berggren, Åsa, Nicolo Dell'Unto, Maurizio Forte, Scott Haddow, Ian Hodder, Justine Issavi, Nicola Lercari, Camilla Mazzucato, Allison Mickel, and James S. Taylor. 2015. "Revisiting Reflexive Archaeology at Çatalhöyük: Integrating Digital and 3D Technologies at the Trowel's Edge." *Antiquity* 89 (344): 433–448. DOI: 10.15184/aqy.2014.43.

Berggren, Åsa, and Anders Gutehall. 2018. "Going from Analogue to Digital: A Study of Documentation Methods during an Excavation of the Neolithic Flint Mines at Pilbladet, Sweden." *Current Swedish Archaeology* 26 (1): 119–158. DOI: 10.37718/CSA.2018.10.

Bevan, Andrew. 2012. "Value, Authority and the Open Society. Some Implications for Digital and Online Archaeology." In *Archaeology and Digital Communication: Towards Strategies of Public Engagement,* edited by Chiara Bonacchi, 1–14. London, UK: Archetype.

Bevan, Andrew. 2015. "The Data Deluge." *Antiquity* 89 (348): 1473–1484. DOI: 10.15184/aqy.2015.102.

Blumer, Herbert. 1954. "What Is Wrong with Social Theory?" *American Sociological Review* 19 (1): 3–10. DOI: 10.2307/2088165.

Bowen, Glenn A. 2006. "Grounded Theory and Sensitizing Concepts:" *International Journal of Qualitative Methods* 5 (3): 12–23. DOI: 10.1177/160940690600500304.

Bowker, Geoffrey C. 1994. *Science on the Run: Information Management and Industrial Geophysics at Schlumberger, 1920-1940.* MIT Press.

Bowker, Geoffrey C., Karen Baker, Florence Millerand, and David Ribes. 2010. "Toward Information Infrastructure Studies: Ways of Knowing in a Networked Environment." In *International Handbook of Internet Research,* edited by Jeremy Hunsinger, Lisbeth Klastrup, and Matthew Allen, 97–117. Dordrecht: Springer Netherlands. DOI: 10.1007/978-1-4020-9789-8_5.

Brown, K. S. 1998. "Contests of Heritage and the Politics of Preservation in the Former Yugoslav Republic of Macedonia." In *Archaeology Under Fire: Nationalism, Politics and Heritage in the Eastern Mediterranean and Middle East,* edited by Lynn Meskell, 68–86. Routledge.

Buccellati, Giorgio. 2017. *A Critique of Archaeological Reason: Structural, Digital, and Philosophical Aspects of the Excavated Record.* Cambridge University Press.

Buchanan, Sarah A. 2019. "The Assemblage of Repository and Museum Work in Archaeological Curation." *Information Research* 24 (2).

Bush, Vannevar. 1945. "As We May Think." *The Atlantic Monthly* 176 (1): 101–108.

Callon, Michel. 1984. "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Brieuc Bay." *The Sociological Review* 32 (1): 196–233. DOI: 10.1111/j.1467-954X.1984.tb00113.x.

Caraher, William. 2016. "Slow Archaeology: Technology, Efficiency, and Archaeological Work." In *Mobilizing the Past for a Digital Future: The Potential of Digital Archaeology,* edited by Erik Walcek Averett, Jody Michael Gordon, and Derek B. Counts, 421–441. Grand Forks, North Dakota: The Digital Press at the University of North Dakota.

———. 2019. "Slow Archaeology, Punk Archaeology, and the 'Archaeology of Care'." *European Journal of Archaeology* 22 (3): 372–385. DOI: 10/gf5ffj.

———. 2022. "Collaborative Digital Publishing in Archaeology." In *Critical Archaeology in the Digital Age: Proceedings of the 12th IEMA Visiting Scholar's Conference,* edited by Kevin Garstki, 153–163. ISD LLC.

Caraher, William, Grace Erny, Alyssa Friedman, Scott Gallimore, Melanie Godsey, Machal Gradoz, Sarah James, Stephanie Steinke, and Dimitri Nakassis. 2020. "Western Argolid Regional Project (WARP), Field Manual 2014-2016 Seasons," DOI: 10.6067/xcv8458238.

Caraher, William, and Andrew Reinhard. 2015. "From Blogs to Books: Blogging as Community, Practice, and Platform." *Internet Archaeology* 39. DOI: 10.11141/ia.39.7.

Carman, John. 2018. "'Herding Cats': Building Archaeological Communities." *Journal of Community Archaeology & Heritage* 5 (1): 45–54. DOI: 10.1080/20518196.2017.1253208.

Carver, Martin O.H. 1989. "Digging for Ideas." *Antiquity* 63 (241): 666–674. DOI: 10.1017/S0003598X00076808.

———. 1990. "Digging for Data: Archaeological Approaches to Data Definition, Acquisition and Analysis." In *Lo Scavo Archeologico: Dalla Diagnosi All'edizione,* edited by Riccardo Francovich and Daniele Manacorda, 45–120. Firenze: Al Insegna dell Giglio.

———. 2010. *Archaeological Investigation.* 1st ed. Routledge. DOI: 10.4324/9780203523124.

Chadha, Ashish. 2002. "Visions of Discipline: Sir Mortimer Wheeler and the Archaeological Method in India (1944-1948)." *Journal of Social Archaeology* 2 (3): 378–401. DOI: 10.1177/146960530200200305.

Chadwick, Adrian. 2003. "Post-Processualism, Professionalization and Archaeological Methodologies. Towards Reflective and Radical Practice." *Archaeological Dialogues* 10 (1): 97–117. DOI: 10.1017/S1380203803001107.

Chan, Marjorie A., Shanan E. Peters, and Basil Tikoff. 2016. "The Future of Field Geology, Open Data Sharing and Cybertechnology in Earth Science." *The Sedimentary Record* 14 (1): 4–10. DOI: 10.2110/sedred.2016.1.4.

Chapman, Robert, and Alison Wylie. 2016. *Evidential Reasoning in Archaeology.* Bloomsbury Academic.

Charmaz, Kathy. 2003. "Grounded Theory: Objectivist and Constructivist Methods." In *Handbook of Qualitative Research,* 2nd ed., edited by Norman K. Denzin and Yvonna S. Lincoln, 249–291. Thousand Oaks, California: SAGE.

———. 2014. *Constructing Grounded Theory.* 2nd ed. Sage Publications Ltd.

Chippindale, Christopher. 2000. "Capta and Data: On the True Nature of Archaeological Information." *American Antiquity* 65 (4): 605–612. DOI: 10.2307/2694418.

Choi, In Young, Tae-Min Kim, Myung Shin Kim, Seong K. Mun, and Yeun-Jun Chung. 2013. "Perspectives on Clinical Informatics: Integrating Large-Scale Clinical, Genomic, and Health Information for Clinical Care." *Genomics & Informatics* 11 (4): 186. DOI: 10.5808/GI.2013.11.4.186.

Clarke, Adele E., and Susan Leigh Star. 2008. "The Social Worlds Framework: A Theory/Methods Package." In *The Handbook of Science and Technology Studies,* 3rd ed., edited by Edward Hackett, Olga Amsterdamska, Michael Lynch, and Judy Wacjman, 113–137. Cambridge, MA: MIT Press.

Clarke, David L. 2014. *Analytical Archaeology.* Routledge. DOI: 10.4324/9781315748481.

Cohen-Smith, Hannah, Simon H. Bickler, Benjamin Jones, Bernie Larsen, and Aaron Apfel. 2022. "New Tech for Old Jobs: Handheld LiDAR for Feature Recording." *Archaeology in New Zealand* 14:14–27.

Coleman, E. Gabriella. 2012. *Coding Freedom: The Ethics and Aesthetics of Hacking.* Princeton University Press. DOI: 10.1515/9781400845293.

Contreras, Daniel A., Zachary Batist, Ciara Zogheib, and Tristan Carter. 2021. "Matching Pragmatic Lithic Analysis and Proper Data Architecture: The QuARI R Shiny Database Interface." *Advances in Archaeological Practice* 9 (4): 299–311. DOI: 10.1017/aap.2021.11.

Cook, Katherine. 2018. "Open Data as Public Archaeology: The Monumental Archive Project." *AP: Online Journal in Public Archaeology* 8 (2): 177–194. DOI: 10.23914/ap.v8i2.152.

Cook, Katherine, Canan Çakirlar, Timothy Goddard, Robert Carl DeMuth, and Joshua Wells. 2018. "Teaching Open Science: Published Data and Digital Literacy in Archaeology Classrooms." *Advances in Archaeological Practice* 6 (2): 144–156. DOI: 10.1017/aap.2018.5.

Cooper, Anwen, and Chris Green. 2016. "Embracing the Complexities of 'Big Data' in Archaeology: The Case of the English Landscape and Identities Project." *Journal of Archaeological Method and Theory* 23 (1): 271–304. DOI: 10.1007/s10816-015-9240-4.

Costa, Stefano, Anthony Beck, Andrew Bevan, and Jessica Ogden. 2013. "Defining and Advocating Open Data in Archaeology." In *CAA2012 Proceedings of the 40th Conference in Computer Applications and Quantitative Methods in Archaeology, Southampton, United Kingdom, 26-30 March 2012,* edited by Graeme Earl, Tim Sly, Angeliki Chrysanthi, Patricia Murrieta-Flores, Constantinos Papadopoulos, Iza Romanowska, and David Wheatley, 449–456. Southampton, United Kingdom: Amsterdam University Press.

Couldry, Nick, and Jun Yu. 2018. "Deconstructing Datafication's Brave New World." *New Media & Society* 20 (12): 4473–4491. DOI: 10.1177/1461444818775968.

Cowgill, George L. 1967. "Computer Applications in Archaeology." In *Proceedings of the November 14-16, 1967, Fall Joint Computer Conference,* 331–337. AFIPS '67 (Fall). New York, NY, USA: Association for Computing Machinery. DOI: 10.1145/1465611.1465654.

Crutchley, Simon, and Peter Crow. 2018. *Using Airborne Lidar in Archaeological Survey: The Light Fantastic.* Historic England.

Dallas, Costis. 2015. "Curating Archaeological Knowledge in the Digital Continuum: From Practice to Infrastructure." *Open Archaeology* 1 (1): 176–207. DOI: 10.1515/opar-2015-0011.

———. 2016. "Digital Curation beyond the "Wild Frontier": A Pragmatic Approach." *Archival Science* 16 (4): 421–457. DOI: 10.1007/s10502-015-9252-6.

Daston, Lorraine, and Peter Galison. 1992. "The Image of Objectivity." *Representations* 40:81–128. DOI: 10.2307/2928741.

de Laet, Marianne, and Annemarie Mol. 2000. "The Zimbabwe Bush Pump: Mechanics of a Fluid Technology." *Social Studies of Science* 30 (2): 225–263. DOI: 10.1177/030631200030002002.

DiMaggio, Paul J., and Walter W. Powell. 1983. "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields." *American Sociological Review* 48 (2): 147. DOI: 10.2307/2095101.

Dorrell, Peter G. 1994. *Photography in Archaeology and Conservation.* 2nd ed. Cambridge Manuals in Archaeology. Cambridge, U.K. ; New York: Cambridge University Press.

Drucker, Johanna. 2011. "Humanities Approaches to Graphical Display." *Digital Humanities Quarterly* 5 (1).

Dunnell, Robert C. 1992. "The Notion Site." In *Space, Time, and Archaeological Landscapes,* edited by Jacqueline Rossignol and LuAnn Wandsnider, 21–41. Interdisciplinary Contributions to Archaeology. Boston, MA: Springer US. DOI: 10.1007/978-1-4899-2450-6_2.

Eddisford, Daniel, and Colleen Morgan. 2019. "Single Context Archaeology as Anarchist Praxis." *Journal of Contemporary Archaeology* 5 (2): 245–254. DOI: 10.1558/jca.33580.

Edgeworth, Matt. 1991. "The Act of Discovery: An Ethnography of the Subject-Object Relation in Archaeological Practice." PhD diss., Durham University.

———. 2003. *Acts of Discovery: An Ethnography of Archaeological Practice.* Vol. 1131. British Archaeological Reports.

Edwards, Paul N., Matthew S. Mayernik, Archer L. Batcheller, Geoffrey C. Bowker, and Christine L. Borgman. 2011. "Science Friction: Data, Metadata, and Collaboration." *Social Studies of Science* 41 (5): 667–690. DOI: 10.1177/0306312711413314.

Engeström, Y. 2000. "Activity Theory as a Framework for Analyzing and Redesigning Work." *Ergonomics* 43 (7): 960–974. DOI: 10.1080/001401300409143.

Ettarh, Fobazi. 2018. "Vocational Awe and Librarianship: The Lies We Tell Ourselves – In the Library with the Lead Pipe." *In the Library with the Lead Pipe.*

Everill, Paul. 2007. "A Day in the Life of a Training Excavation: Teaching Archaeological Fieldwork in the UK." *World Archaeology* 39 (4): 483–498. DOI: 10.1080/00438240701676243.

Faniel, Ixchel, Eric C. Kansa, Sarah Whitcher Kansa, Julianna Barrera-Gomez, and Elizabeth Yakel. 2013. "The Challenges of Digging Data: A Study of Context in Archaeological Data Reuse." In *Proceedings of the 13th ACM/IEEE-CS Joint Conference on Digital Libraries,* 295–304. New York: ACM. DOI: 10.1145/2467696.2467712.

Faniel, Ixchel M., and Ann Zimmerman. 2011. "Beyond the Data Deluge: A Research Agenda for Large-Scale Data Sharing and Reuse." *International Journal of Digital Curation* 6 (1): 58–69. DOI: 10.2218/ijdc.v6i1.172.

Farid, Shahina. 2014. "'Proportional Representation': Multiple Voices in Archaeological Interpretation at Çatalhöyük." In *Material Evidence: Learning from Archaeological Practice,* edited by Robert Adams and Alison Wylie, 79–98. Routledge.

Fisher, Michael, Michael Fradley, Pascal Flohr, Bijan Rouhani, and Francesca Simi. 2021. "Ethical Considerations for Remote Sensing and Open Data in Relation to the Endangered Archaeology in the Middle East and North Africa Project." *Archaeological Prospection* 28 (3): 279–292. DOI: 10.1002/arp.1816.

Fleck, Ludwik. 2012. *Genesis and Development of a Scientific Fact.* Chicago: University of Chicago Press.

Flick, Uwe. 1997. "The Episodic Interview. Small Scale Narratives as Approach to Relevant Experiences." *London School of Economics Methodology Institute: Discussion papers-qualitative series.*

———. 2000. "Episodic Interviewing." In *Qualitative Researching with Text, Image and Sound,* 76–92. London: SAGE Publications Ltd. DOI: 10.4135/9781849209731.n5.

Foster, Erin D., and Ariel Deardorff. 2017. "Open Science Framework (OSF)." *Journal of the Medical Library Association : JMLA* 105 (2): 203–206. DOI: 10.5195/jmla.2017.88.

Fotiadis, Michael. 1992. "Units of Data as Deployment of Disciplinary Codes." In *Representations in Archaeology,* edited by Jean-Claude Gardin and Christopher S. Peebles, 132–148. Indiana University Press.

Fredheim, L. Harald. 2020. "Decoupling 'Open' and 'Ethical' Archaeologies: Rethinking Deficits and Expertise for Ethical Public Participation in Archaeology and Heritage." *Norwegian Archaeological Review* 53 (1): 5–22. DOI: 10.1080/00293652.2020.1738540.

Frické, Martin. 2009. "The Knowledge Pyramid: A Critique of the DIKW Hierarchy." *Journal of Information Science* 35 (2): 131–142. DOI: 10.1177/0165551508094050.

Gardin, Jean-Claude. 1958. "Four Codes for the Description of Artifacts: An Essay in Archeological Technique and Theory." *American Anthropologist* 60 (2): 335–357. DOI: 10.1525/aa.1958.60.2.02a00090.

———. 1989. "Artificial Intelligence and the Future of Semiotics: An Archaeological Perspective." *Semiotica* 77 (1-3): 5–26. DOI: 10.1515/semi.1989.77.1-3.5.

Gergatsoulis, Manolis, Georgios Papaioannou, Eleftherios Kalogeros, and Robert Carter. 2021. "Representing Archeological Excavations Using the CIDOC CRM Based Conceptual Models." In *Metadata and Semantic Research,* edited by Emmanouel Garoufallou and María-Antonia Ovalle-Perandones, 355–366. Communications in Computer and Information Science. Cham: Springer International Publishing. DOI: 10.1007/978-3-030-71903-6_33.

Gero, Joan M. 1985. "Socio-Politics and the Woman-at-Home Ideology." *American Antiquity* 50 (2): 342–350. DOI: 10.2307/280492.

———. 1996. "Archaeological Practice and Gendered Encounters with Field Data." *Gender and archaeology,* 251–280.

Glaser, Barney G., and Anselm L. Strauss. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research.* DOI: 10.4324/9780203793206-1.

Goodwin, Charles. 1994. "Professional Vision." *American Anthropologist* 96 (3): 606–633. DOI: 10.1525/aa.1994.96.3.02a00100.

———. 2010. "Things and Their Embodied Environments." In *The Cognitive Life of Things: Recasting the Boundaries of the Mind,* edited by Lambros Malafouris and Colin Renfrew, 103–120. Cambridge: McDonald Institute of Archaeological Research.

Gorwa, Robert. 2019. "What Is Platform Governance?" *Information, Communication & Society* 22 (6): 854–871. DOI: 10.1080/1369118X.2019.1573914.

Graham, Shawn. 2019. *Failing Gloriously and Other Essays.* Grand Forks, North Dakota: The Digital Press at the University of North Dakota.

Griffiths, Nick, Anne Jenner, and Christine Wilson. 2007. *Drawing Archaeological Finds: A Handbook.* Revised. London: Archetype Publications.

Gupta, Neha, Andrew Martindale, Kisha Supernant, and Michael Elvidge. 2023. "The CARE Principles and the Reuse, Sharing, and Curation of Indigenous Data in Canadian Archaeology." *Advances in Archaeological Practice* 11 (1): 76–89. DOI: 10.1017/aap.2022.33.

Hacıgüzeller, Piraye, James Stuart Taylor, and Sara Perry. 2021. "On the Emerging Supremacy of Structured Digital Data in Archaeology: A Preliminary Assessment of Information, Knowledge and Wisdom Left Behind." *Open Archaeology* 7 (1): 1709–1730. DOI: 10.1515/opar-2020-0220.

Hamilton, Carolyn. 2000. "Faultlines: The Construction of Archaeological Knowledge at Catalhöyük." In *Towards Reflexive Method in Archaeology : The Example at Çatalhöyük,* edited by Ian Hodder, 119–127. Cambridge: McDonald Institute for Archaeological Research.

Harnad, Stevan. 1998. "Learned Inquiry and the Net: The Role of Peer Review, Peer Commentary and Copyright." *Learned Publishing* 11 (4): 283–292. DOI: 10.1087/09531519850146229.

Heath-Stout, Laura E., and Elizabeth M. Hannigan. 2020. "Affording Archaeology: How Field School Costs Promote Exclusivity." *Advances in Archaeological Practice* 8 (2): 123–133. DOI: 10.1017/aap.2020.7.

Hodder, Ian. 1989. "Writing Archaeology: Site Reports in Context." *Antiquity* 63 (239): 268–274. DOI: 10.1017/S0003598X00075980.

———. 1997. "'Always Momentary, Fluid and Flexible': Towards a Reflexive Excavation Methodology." *Antiquity* 71 (273): 691–700. DOI: 10.1017/S0003598X00085410.

———. 1998. "Whose Rationality? A Response to Fekri Hassan." *Antiquity* 72 (275): 213–217. DOI: 10.1017/S0003598X00086439.

———, ed. 2000. *Towards Reflexive Method in Archaeology : The Example at Çatalhöyük.* Cambridge : McDonald Institute for Archaeological Research, University of Cambridge ; Oxford : Distributed by Oxbow Books.

———. 2003. "Archaeological Reflexivity and the "Local" Voice." *Anthropological Quarterly* 76 (1): 55–69. DOI: 10.1353/anq.2003.0010.

Holdaway, Simon J., Joshua Emmitt, Rebecca Phillipps, and Sina Masoud-Ansari. 2019. "A Minimalist Approach to Archaeological Data Management Design." *Journal of Archaeological Method and Theory* 26 (2): 873–893. DOI: 10.1007/s10816-018-9399-6.

Holtorf, Cornelius. 2006. "Studying Archaeological Fieldwork in the Field: Views from Monte Polizzo." In *Ethnographies of Archaeological Practice: Cultural Encounters, Material Transformations,* edited by Matt Edgeworth, 81–94. Lanham, Maryland: AltaMira Press.

Huggett, Jeremy. 2004. "Archaeology and the new technological fetishism." *Archeologia e Calcolatori* 15:81–92.

———. 2012. "Promise and Paradox: Accessing Open Data in Archaeology." In *Proceedings of the Digital Humanities Congress,* edited by Clare Mills, Michael Pidd, and Esther Ward. Sheffield, UK: HRI Online Publications.

Huggett, Jeremy. 2015a. "A Manifesto for an Introspective Digital Archaeology." *Open Archaeology* 1 (1): 86–95. DOI: 10.1515/opar-2015-0002.

———. 2015b. "Digital Haystacks: Open Data and the Transformation of Archaeological Knowledge." In *Open Source Archaeology: Ethics and Practice,* edited by Andrew T. Wilson and Ben Edwards, 6–29. De Gruyter Open.

———. 2017. "The Apparatus of Digital Archaeology." *Internet Archaeology* 44. DOI: 10.11141/ia.44.7.

———. 2018. "Reuse Remix Recycle: Repurposing Archaeological Digital Data." *Advances in Archaeological Practice* 6 (2): 93–104. DOI: 10.1017/aap.2018.1.

———. 2022. "Data Legacies, Epistemic Anxieties, and Digital Imaginaries in Archaeology." *Digital* 2 (2): 267–295. DOI: 10.3390/digital2020016.

Huggett, Jeremy, Paul Reilly, and Gary Lock. 2018. "Whither Digital Archaeological Knowledge? The Challenge of Unstable Futures." *Journal of Computer Applications in Archaeology* 1 (1): 42–54. DOI: 10.5334/jcaa.7.

Hutchins, Edwin. 1995. "How a Cockpit Remembers Its Speeds." *Cognitive Science* 19 (3): 265–288. DOI: 10.1207/s15516709cog1903_1.

Huvila, Isto. 2011. "The Politics of Boundary Objects: Hegemonic Interventions and the Making of a Document." *Journal of the American Society for Information Science and Technology* 62 (12): 2528–2539. DOI: 10.1002/asi.21639.

———. 2016. "Awkwardness of Becoming a Boundary Object: Mangle and Materialities of Reports, Documentation Data, and the Archaeological Work." *The Information Society* 32 (4): 280–297. DOI: 10.1080/01972243.2016.1177763.

———, ed. 2018. *Archaeology and Archaeological Information in the Digital Society.* Abingdon, Oxon ; New York, NY: Routledge.

Huvila, Isto, Lisa Andersson, and Olle Sköld. 2022. "Citing Methods Literature: Citations to Field Manuals as Paradata on Archaeological Fieldwork." *Information Research: an international electronic journal* 27 (3). DOI: 10.47989/irpaper941.

Huvila, Isto, Lisa Börjesson, and Olle Sköld. 2022. "Archaeological Information-Making Activities According to Field Reports." *Library & Information Science Research* 44 (3): 101171. DOI: 10.1016/j.lisr.2022.101171.

Huvila, Isto, Olle Sköld, and Lisa Börjesson. 2021. "Documenting Information Making in Archaeological Field Reports." *Journal of Documentation* 77 (5): 1107–1127. DOI: 10.1108/JD-11-2020-0188.

Huysman, Marleen, and Bente Elkjaer. 2006. "Organizations as Arenas of Social Worlds; towards an Alternative Perspective on Organizational Learning?" In *OLKC 2006 Conference at the University of Warwick, Coventry on 20th - 22nd March 2006.* Warwick, UK.

Isaksen, Leif, Kirk Martinez, Nicholas Gibbins, Graeme Earl, and Simon Keay. 2010. "Interoperate with Whom? Formality, Archaeology and the Semantic Web." In *Web Science Conference 2010.* Raleigh, North Carolina.

Jackson, Sarah E. 2017. "Envisioning Artifacts: A Classic Maya View of the Archaeological Record." *Journal of Archaeological Method and Theory* 24 (2): 579–610. DOI: 10.1007/s10816-016-9278-y.

Joyce, Arthur A. 2009. "Theorizing Urbanism in Ancient Mesoamerica." *Ancient Mesoamerica* 20 (02): 189–196. DOI: 10.1017/S0956536109990125.

Joyce, Rosemary A., and Robert W. Preucel. 2002. "Writing the Field of Archaeology." In *The Languages of Archaeology,* edited by Rosemary A. Joyce, 18–38. Blackwell Publishers Ltd. DOI: 10.1002/9780470693520.ch2.

Kadar, Manuella. 2002. "Data Modeling and Relational Database Design in Archaeology." *Acta Universitatis Apulensis* 3:73–80.

Kansa, Eric C. 2012. "Openness and Archaeology's Information Ecosystem." *World Archaeology* 44 (4). DOI: 10.1080/00438243.2012.737575.

———. 2014. "The Need to Humanize Open Science." In *Issues in Open Research Data,* edited by Samuel A. Moore, 31–58. London, UK: Ubiquity Press.

Kansa, Eric C., and Sarah Whitcher Kansa. 2013. "We All Know That a 14 Is a Sheep: Data Publication and Professionalism in Archaeological Communication." *Journal of Eastern Mediterranean Archaeology and Heritage Studies* 1 (1): 88–97. DOI: 10.1353/ema.2013.0007.

Kansa, Eric C., Sarah Whitcher Kansa, and Benjamin Arbuckle. 2014. "Publishing and Pushing: Mixing Models for Communicating Research Data in Archaeology." *International Journal of Digital Curation* 9 (1): 57–70. DOI: 10.2218/ijdc.v9i1.301.

Kelle, Udo. 2005. ""Emergence" vs. "Forcing" of Empirical Data? A Crucial Problem of "Grounded Theory" Reconsidered." *Forum: Qualitative Social Research* 6 (2): 133–156. DOI: 10.17169/FQS-6.2.467.

Kelty, Christopher M., Michael MJ Fischer, Alex "Rex" Golub, Jason Baird Jackson, Kimberly Christen, Michael F. Brown, and Tom Boellstorff. 2008. "Anthropology of/in Circulation: The Future of Open Access and Scholarly Societies." *Cultural Anthropology* 23 (3): 559–588. DOI: 10/bxq8tx.

Kintigh, Keith W., Jeffrey H. Altschul, Mary C. Beaudry, Robert D. Drennan, Ann P. Kinzig, Timothy A. Kohler, W. Fredrick Limp, et al. 2014. "Grand Challenges for Archaeology." *American Antiquity* 79 (1): 5–24. DOI: 10.7183/0002-7316.79.1.5.

Kintigh, Keith W., Jeffrey H. Altschul, Ann P. Kinzig, W. Fredrick Limp, William K. Michener, Jeremy A. Sabloff, Edward J. Hackett, Timothy A. Kohler, Bertram Ludäscher, and Clifford A. Lynch. 2015. "Cultural Dynamics, Deep Time, and Data: Planning Cyberinfrastructure Investments for Archaeology." *Advances in Archaeological Practice* 3 (1): 1–15. DOI: 10.7183/2326-3768.3.1.1.

Klehm, Carla, Elisabeth Hildebrand, and Maureen S. Meyers. 2021. "Mitigating Chronic Diseases during Archaeological Fieldwork: Lessons from Managing Asthma, Diabetes, and Depression." *Advances in Archaeological Practice* 9 (1): 41–48. DOI: 10.1017/aap.2020.49.

Kling, Rob, and Elihu M. Gerson. 1978. "Patterns Of Segmentation And Intersection In The Computing World." *Symbolic Interaction* 1 (2): 24–43. DOI: 10.1525/si.1978.1.2.24.

Kling, Rob, Geoffrey McKim, and Adam King. 2003. "A Bit More to It: Scholarly Communication Forums as Socio-Technical Interaction Networks." *Journal of the American Society for Information Science and Technology* 54 (1): 47–67. DOI: 10.1002/asi.10154.

Knapp, A. Bernard, and Sophia Antoniadou. 1998. "Archaeology, Politics and the Cultural Heritage of Cyprus." In *Archaeology Under Fire: Nationalism, Politics and Heritage in the Eastern Mediterranaean and Middle East,* edited by Lynn Meskell, 13–43. London and New York: Routledge.

Knoll, Michelle K., and A. Carver-Kubik. 2019. "In-Field Digital Photography and the Curation of Associated Records: Not All Prints Are Created Equal." *Advances in Archaeological Practice* 7 (3): 302–310. DOI: 10.1017/aap.2019.17.

Knorr Cetina, Karin. 1999. *Epistemic Cultures: How the Sciences Make Knowledge.* Harvard University Press.

———. 2001. "Objectual Practice." In *The Practice Turn in Contemporary Theory,* edited by Theodore R. Schatzki, Karin Knorr Cetina, and Eike von Savigny, 175–188. London and New York: Routledge.

Kristiansen, Kristian. 2014. "Towards a New Paradigm? The Third Science Revolution and Its Possible Consequences in Archaeology." *Current Swedish Archaeology* 22 (1): 11–34. DOI: 10.37718/CSA.2014.01.

Latour, Bruno. 1992. "Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts." In *Shaping Technology/Building Society: Studies in Sociotechnical Change,* edited by W.E. Bijker and John Law, 225–258. Cambridge, Massachusetts: MIT Press.

Latour, Bruno, and Steve Woolgar. 1986. *Laboratory Life: The Construction of Scientific Facts.* 2nd ed. Princeton, New Jersey: Princeton University Press.

Lave, Jean, and Etienne Wenger. 1991. *Situated Learning: Legitimate Peripheral Participation.* Cambridge, United Kingdom: Cambridge University Press.

Law, John. 2008. "Actor Network Theory and Material Semiotics." In *The New Blackwell Companion to Social Theory,* edited by Bryan S. Turneressor, 141–158. Wiley-Blackwell. DOI: 10.1002/9781444304992.ch7.

Leont'ev, A. N. 1974. "The Problem of Activity in Psychology." *Soviet Psychology* 13 (2): 4–33. DOI: 10.2753/RPO1061-040513024.

Lock, Gary. 2003. *Using Computers in Archaeology: Towards Virtual Pasts.* London: Routledge. DOI: 10.4324/9780203451076.

Lucas, Gavin. 2001. *Critical Approaches to Fieldwork: Contemporary and Historical Archaeological Practice.* Taylor & Francis.

———. 2012. *Understanding the Archaeological Record.* Cambridge University Press.

———. 2019. *Writing the Past: Knowledge and Literary Production in Archaeology.* Abingdon, Oxon ; New York, NY: Routledge.

Lukas, Dominik, Claudia Engel, and Camilla Mazzucato. 2018. "Towards a Living Archive: Making Multi Layered Research Data and Knowledge Generation Transparent." *Journal of Field Archaeology* 43 (sup1): S19–S30. DOI: 10.1080/00934690.2018.1516110.

Madgwick, Richard, Angela Lamb, Hilary Sloane, Alexandra Nederbragt, Umberto Albarella, Mike Parker Pearson, and Jane Evans. 2021. "A Veritable Confusion: Use and Abuse of Isotope Analysis in Archaeology." *Archaeological Journal* 178 (2): 361–385. DOI: 10.1080/00665983.2021.1911099.

Martínez-del-Pozo, José-Ángel, Victorino Mayoral-Herrera, and Pedro Ortiz-Coder. 2013. "Creating and Analysing Digital Terrain Models for Archaeological Research." In *Good Practice in Archaeological Diagnostics: Non-invasive Survey of Complex Archaeological Sites,* edited by Cristina Corsi, Božidar Slapšak, and Frank Vermeulen, 227–243. Natural Science in Archaeology. Cham: Springer International Publishing. DOI: 10.1007/978-3-319-01784-6_13.

Maryl, Maciej, Costis Dallas, Jennifer Edmond, Jessie Labov, Ingrida Kelpšienė, Michelle Doran, Marta Kołodziejska, and Klaudia Grabowska. 2020. "A Case Study Protocol for Meta-Research into Digital Practices in the Humanities." *Digital Humanities Quarterly* 14 (3).

McKeague, Peter, Anthony Corns, Åsa Larsson, Anne Moreau, Axel Posluschny, Koen Van Daele, and Tim Evans. 2020. "One Archaeology: A Manifesto for the Systematic and Effective Use of Mapped Data from Archaeological Fieldwork and Research." *Information-an International Interdisciplinary Journal* 11 (4): 222. DOI: 10.3390/info11040222.

McManamon, Francis P., Keith W. Kintigh, Leigh Anne Ellison, and Adam Brin. 2017. "tDAR: A Cultural Heritage Archive for Twenty-First-Century Public Outreach, Research, and Resource Management." *Advances in Archaeological Practice* 5 (3): 238–249. DOI: 10.1017/aap.2017.18.

McManus, Elizabeth Caitrin. 2012. "Unearthing Archives : An Examination of Documents Generated in the Course of Archaeological Fieldwork in Canada." Master's thesis, University of British Columbia. DOI: 10.14288/1.0072729.

McPherron, Shannon J. P. 2005. "Artifact Orientations and Site Formation Processes from Total Station Proveniences." *Journal of Archaeological Science* 32 (7): 1003–1014. DOI: 10.1016/j.jas.2005.01.015.

Mesquida Calafat, Antoni-Lluís, Antonia Mas, and Marcos Pacheco. 2022. "Fake Agile: What Is It and How to Avoid It?" *IT Professional* 24 (2): 69–73. DOI: 10.1109/MITP.2021.3139826.

Mickel, Allison. 2015. "Reasons for Redundancy in Reflexivity: The Role of Diaries in Archaeological Epistemology." *Journal of Field Archaeology* 40 (3): 300–309. DOI: 10.1179/2042458214Y.0000000002.

———. 2021. *Why Those Who Shovel Are Silent: A History of Local Archaeological Knowledge and Labor.* Louisville, CO: University Press of Colorado.

Mickel, Allison, and Elijah Meeks. 2015. "Networking the Teams and Texts of Archaeological Research at Çatalhöyük." In *Assembling Çatalhöyük,* edited by Ian Hodder and Arkadiusz Marciniak, 25–42. Routledge.

Mills, Jane, Ann Bonner, and Karen Francis. 2006. "The Development of Constructivist Grounded Theory." *International Journal of Qualitative Methods* 5 (1): 25–35. DOI: 10.1177/160940690600500103.

Moody, Bryony, Tom Dye, Keith May, Holly Wright, and Caitlin Buck. 2021. "Digital Chronological Data Reuse in Archaeology: Three Case Studies with Varying Purposes and Perspectives." *Journal of Archaeological Science: Reports* 40:103188. DOI: 10.1016/j.jasrep.2021.103188.

Morgan, Colleen. 2019. "Avatars, Monsters, and Machines: A Cyborg Archaeology." *European Journal of Archaeology* 22 (3): 324–337. DOI: 10/gf2txq.

Morgan, Colleen. 2022. "Current Digital Archaeology." *Annual Review of Anthropology* 51 (1): 213–231. DOI: 10.1146/annurev-anthro-041320-114101.

Morgan, Colleen, and Daniel Eddisford. 2015. "Dig Houses, Dwelling, and Knowledge Production in Archaeology." *Journal of Contemporary Archaeology* 2 (1): 169–193. DOI: 10.1558/jca.v2i1.22331.

Morgan, Colleen, and Stuart Eve. 2012. "DIY and Digital Archaeology: What Are You Doing to Participate?" *World Archaeology* 44 (4): 521–537. DOI: 10.1080/00438243.2012.741810.

Morgan, Colleen, Helen Petrie, Holly Wright, and James Stuart Taylor. 2021. "Drawing and Knowledge Construction in Archaeology: The Aide Mémoire Project." *Journal of Field Archaeology* 46 (8): 614–628. DOI: 10.1080/00934690.2021.1985304.

Morgan, Colleen, and Holly Wright. 2018. "Pencils and Pixels: Drawing and Digital Media in Archaeological Field Recording." *Journal of Field Archaeology* 43 (2): 136–151. DOI: 10.1080/00934690.2018.1428488.

Moser, Stephanie. 2007. "On Disciplinary Culture: Archaeology as Fieldwork and Its Gendered Associations." *Journal of Archaeological Method and Theory* 14 (3): 235–263. DOI: 10.1007/s10816-007-9033-5.

Niccolucci, Franco, and Julian D. Richards. 2013. "ARIADNE: Advanced Research Infrastructures for Archaeological Dataset Networking in Europe." *International Journal of Humanities and Arts Computing* 7 (1-2): 70–88. DOI: 10.3366/ijhac.2013.0082.

Nicolini, Davide. 2009. "Zooming In and Out: Studying Practices by Switching Theoretical Lenses and Trailing Connections." *Organization Studies* 30 (12): 1391–1418. DOI: 10.1177/0170840609349875.

Nieborg, David B, and Thomas Poell. 2018. "The Platformization of Cultural Production: Theorizing the Contingent Cultural Commodity." *New Media & Society* 20 (11): 4275–4292. DOI: 10.1177/1461444818769694.

Niklasson, Elisabeth. 2016. "Funding Matters : Archaeology and the Political Economy of the Past in the EU." PhD diss., University of Stockholm.

Nilsson Stutz, Liv. 2018. "A Future for Archaeology: In Defense of an Intellectually Engaged, Collaborative and Confident Archaeology." *Norwegian Archaeological Review* 51 (1-2): 48–56. DOI: 10.1080/00293652.2018.1544168.

Nolin, Jan Michael. 2019. "Data as Oil, Infrastructure or Asset? Three Metaphors of Data as Economic Value." *Journal of Information, Communication and Ethics in Society* 18 (1): 28–43. DOI: 10.1108/JICES-04-2019-0044.

Nungesser, Frithjof. 2021. "Pragmatism and Interaction." In *The Routledge International Handbook of Interactionism,* edited by Dirk Vom Lehn, Natalia Ruiz-Junco, and Will Gibson, 25–36. London and New York: Routledge.

Olsen, Bjørnar. 2012. "After Interpretation: Remembering Archaeology." *Current Swedish Archaeology* 20 (1): 11–34. DOI: 10.37718/CSA.2012.01.

Olson, Brandon R., Ryan A. Placchetti, Jamie Quartermaine, and Ann E. Killebrew. 2013. "The Tel Akko Total Archaeology Project (Akko, Israel): Assessing the Suitability of Multi-Scale 3D Field Recording in Archaeology." *Journal of Field Archaeology* 38 (3): 244–262. DOI: 10.1179/0093469013z.00000000056.

Open Knowledge Foundation. 2015. *Open Definition 2.1.* https://opendefinition.org/od/2.1/en/.

Opitz, Rachel, Colleen Strawhacker, Philip Buckland, Jackson Cothren, Tom Dawson, Andrew Dugmore, George Hambrecht, et al. 2021. "A Lockpick's Guide to dataARC: Designing Infrastructures and Building Communities to Enable Transdisciplinary Research." *Internet Archaeology* 56. DOI: 10.11141/ia.56.15.

Parr, C, and M Cummings. 2005. "Data Sharing in Ecology and Evolution." *Trends in Ecology & Evolution* 20 (7): 362–363. DOI: 10.1016/j.tree.2005.04.023.

Perry, Jennifer E. 2004. "Authentic Learning in Field Schools: Preparing Future Members of the Archaeological Community." *World Archaeology* 36 (2): 236–260. DOI: 10.1080/0043824042000261004.

Perry, Sara. 2015. "Changing the Way Archaeologists Work: Blogging and the Development of Expertise." *Internet Archaeology* 39. DOI: 10.11141/ia.39.9.

Perry, Sara. 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: 10.1017/aap.2018.21.

Pertsas, Vayianos, and Panos Constantopoulos. 2017. "Scholarly Ontology: Modelling Scholarly Practices." *International Journal on Digital Libraries* 18 (3): 173–190. DOI: 10.1007/s00799-016-0169-3.

Petrosyan, Artur, Hayk Azizbekyan, Boris Gasparyan, Roberto Dan, Arsen Bobokhyan, and Mariam Amiryan. 2021. "Foregrounding Daily Data Collection on Archaeological Fieldwork." *Advances in Archaeological Practice* 9 (4): 402–414. DOI: 10.1017/aap.2021.30.

Pickering, Andrew. 1992. "From Science as Knowledge to Science as Practice." In *Science as Practice and Culture,* edited by Andrew Pickering, 1–26. University of Chicago Press.

Politis, Gustavo. 2001. "On Archaeological Praxis, Gender Bias and Indigenous Peoples in South America." *Journal of Social Archaeology* 1 (1): 90–107. DOI: 10.1177/146960530100100107.

Puschmann, Cornelius, and Jean Burgess. 2014. "Metaphors of Big Data." *International Journal of Communication* 8:1690–1709.

Quinn, Colin P., and Daniel Fivenson. 2020. "Transforming Legacy Spatial Data into Testable Hypotheses about Socioeconomic Organization." *Advances in Archaeological Practice* 8 (1): 65–77. DOI: 10.1017/aap.2019.37.

Ragin, Charles C. 1992. "Casing and the Process of Social Research." In *What Is a Case? Exploring the Foundations of Social Inquiry,* edited by Charles C. Ragin and Howard S. Becker, 217–226. Cambridge University Press New York.

Richards, Julian D., Ulf Jakobsson, David Novák, Benjamin Štular, and Holly Wright. 2021. "Digital Archiving in Archaeology: The State of the Art. Introduction." *Internet Archaeology* 58. DOI: 10.11141/ia.58.23.

Richards-Rissetto, Heather, and Kristin Landau. 2019. "Digitally-Mediated Practices of Geospatial Archaeological Data: Transformation, Integration, & Interpretation." *Journal of Computer Applications in Archaeology* 2 (1): 120–135. DOI: 10.5334/jcaa.30.

Richardson, Lorna-Jane. 2015. "Micro-Blogging and Online Community." *Internet Archaeology* 39. DOI: 10.11141/IA.39.2.

Roskams, Steve. 2001. *Excavation.* Cambridge Manuals in Archaeology. Cambridge, U.K. ; New York: Cambridge University Press.

Ross, Shawn, Brian Ballsun-Stanton, Adela Sobotkova, and Penny Crook. 2015. "Building the Bazaar: Enhancing Archaeological Field Recording Through an Open Source Approach." In *Open Source Archaeology: Ethics and Practice,* edited by Andrew T. Wilson and Ben Edwards. Warsaw, Poland: De Gruyter Open. DOI: 10.1515/9783110440171-009.

Rowley, Jennifer. 2007. "The Wisdom Hierarchy: Representations of the DIKW Hierarchy." *Journal of Information Science* 33 (2): 163–180. DOI: 10.1177/0165551506070706.

Saldaña, Johnny. 2011. *Fundamentals of Qualitative Research.* Understanding Qualitative Research. New York: Oxford University Press.

Sandoval, Gustavo. 2020. "In Pursuit of a Reflexive Recording. An Epistemic Analysis of Excavation Diaries from the Çatalhöyük Research Project." *Norwegian Archaeological Review* 53 (2): 135–153. DOI: 10.1080/00293652.2020.1854338.

———. 2021. "Single-Context Recording, Field Interpretation and Reflexivity: An Analysis of Primary Data In Context Sheets." *Journal of Field Archaeology* 46 (7): 496–512. DOI: 10.1080/00934690.2021.1926700.

Schiffer, Michael B. 1988. "The Structure of Archaeological Theory." *American Antiquity* 53 (3): 461–485. DOI: 10.2307/281212.

Schmidt, Sophie C., Florian Thiery, and Martina Trognitz. 2022. "Practices of Linked Open Data in Archaeology and Their Realisation in Wikidata." *Digital* 2 (3): 333–364. DOI: 10.3390/digital2030019.

Shanks, Michael. 2007. "Politics of Archaeological Leadership." In *Archaeology and the Media,* 273–290. Routledge.

Shanks, Michael, and Connie Svabo. 2013. "Archaeology and Photography: A Pragmatology." In *Reclaiming Archaeology: Beyond the Tropes of Modernity,* edited by Alfredo González-Ruibal, 89–102. London and New York: Routledge.

Shepherd, Nick. 2003. "State of the Discipline: Science, Culture and Identity in South African Archaeology, 1870–2003." *Journal of Southern African Studies* 29 (4): 823–844. DOI: 10.1080/0305707032000135842.

Sobotkova, Adela. 2018. "Sociotechnical Obstacles to Archaeological Data Reuse." *Advances in Archaeological Practice* 6 (2): 117–124. DOI: 10.1017/aap.2017.37.

Sørensen, Tim Flohr. 2017. "The Two Cultures and a World Apart: Archaeology and Science at a New Crossroads." *Norwegian Archaeological Review* 50 (2): 101–115. DOI: 10.1080/00293652.2017.1367031.

Star, Susan Leigh. 1993. "Cooperation Without Consensus in Scientific Problem Solving: Dynamics of Closure in Open Systems." In *CSCW: Cooperation or Conflict?,* edited by Steve Easterbrook, 93–106. London: Springer. DOI: 10.1007/978-1-4471-1981-4_3.

Stobiecka, Monika. 2020. "Towards a Prosthetic Archaeology." *Journal of Social Archaeology* 20 (3): 335–352. DOI: 10.1177/1469605320937530.

Strauss, Anselm. 1978. "A Social World Perspective." *Studies in symbolic interaction* 1:119–128.

———. 1988. "The Articulation of Project Work: An Organizational Process." *The Sociological Quarterly* 29 (2): 163–178. DOI: 10.1111/j.1533-8525.1988.tb01249.x.

Strauss, Anselm, and Juliet Corbin. 1990. *Basics of Qualitative Research.* Sage Publications.

Strupler, Néhémie, and Toby C. Wilkinson. 2017. "Reproducibility in the Field: Transparency, Version Control and Collaboration on the Project Panormos Survey." *Open Archaeology* 3 (1): 279–304. DOI: 10.1515/opar-2017-0019.

Suber, Peter. 2003. "Open Access to Science and Scholarship." In *World Summit on the Information Society.* Geneva: World Summit on the Information Society (WSIS).

Suchman, Lucy. 2007. *Human-Machine Reconfigurations: Plans and Situated Actions.* 2nd ed. Cambridge University Press.

Taylor, James, Justine Issavi, Åsa Berggren, Dominik Lukas, Camilla Mazzucato, Burcu Tung, and Nicoló Dell'Unto. 2018. "'The Rise of the Machine': The Impact of Digital Tablet Recording in the Field at Çatalhöyük." *Internet Archaeology* 47. DOI: 10.11141/ia.47.1.

Taylor, James, Dominik Lukas, and Åsa Berggren. 2015. "Digital Recording and Reflexive Methodology at Çatalhöyük." Edited by Scott D. Haddow. *Çatalhöyük 2015 Archive Report,* 195–196.

Tennant, Jonathan, Ritwik Agarwal, Ksenija Baždarić, David Brassard, Tom Crick, Daniel J. Dunleavy, Thomas Rhys Evans, et al. 2020. "A Tale of Two 'Opens': Intersections between Free and Open Source Software and Open Scholarship." *SocArXiv,* DOI: 10.31235/osf.io/2kxq8.

Teppati Losè, Lorenzo, Alessandra Spreafico, Filiberto Chiabrando, and Fabio Giulio Tonolo. 2022. "Apple LiDAR Sensor for 3D Surveying: Tests and Results in the Cultural Heritage Domain." *Remote Sensing* 14 (17): 4157. DOI: 10.3390/rs14174157.

Thorpe, Reuben. 2012. "Often Fun, Usually Messy: Fieldwork, Recording and Higher Orders of Things." In *Reconsidering Archaeological Fieldwork: Exploring On-Site Relationships Between Theory and Practice,* edited by Hannah Cobb, Harris Harris Oliver J.T., Cara Jones, and Philip Richardson, 31–52. Springer, Boston, MA. DOI: 10.1007/978-1-4614-2338-6_3.

Turchin, Peter, Harvey Whitehouse, Jennifer Larson, Enrico Cioni, Jenny Reddish, Daniel Hoyer, Patrick E. Savage, et al. 2022. "Big Gods and Big Science: Further Reflections on Theory, Data, and Analysis." *Religion, Brain & Behavior* 13 (2): 218–231. DOI: 10.1080/2153599X.2022.2065354.

VERBI Software. 2021. *MaxQDA 2022.* Berlin.

Voss, Barbara L. 2012. "Curation as Research. A Case Study in Orphaned and Underreported Archaeological Collections." *Archaeological Dialogues* 19 (2): 145–169. DOI: 10/gfc4g7.

———. 2021. "Documenting Cultures of Harassment in Archaeology: A Review and Analysis of Quantitative and Qualitative Research Studies." *American Antiquity* 86 (2): 244–260. DOI: 10.1017/aaq.2020.118.

Waagen, Jitte. 2019. "New Technology and Archaeological Practice. Improving the Primary Archaeological Recording Process in Excavation by Means of UAS Photogrammetry." *Journal of Archaeological Science* 101:11–20. DOI: 10.1016/j.jas.2018.10.011.

Ward, Chloë. 2023. "Encounters with the Archaeological Archive." *Journal of Field Archaeology* 48 (2): 113–129. DOI: 10.1080/00934690.2022.2155768.

Wellen, Richard. 2004. "Taking on Commercial Scholarly Journals: Reflections on the 'Open Access' Movement." *Journal of Academic Ethics* 2 (1): 101–118. DOI: 10.1023/B:JAET.0000039010.14325.3d.

Whitcher Kansa, Sarah. 2015. "Using Linked Open Data to Improve Data Reuse in Zooarchaeology." *Ethnobiology Letters* 6 (2): 224–231. DOI: 10.14237/ebl.6.2.2015.467.

Whittle, Jon, Pete Sawyer, Nelly Bencomo, Betty H.C. Cheng, and Jean-Michel Bruel. 2009. "RELAX: Incorporating Uncertainty into the Specification of Self-Adaptive Systems." In *2009 17th IEEE International Requirements Engineering Conference.* IEEE. DOI: 10.1109/re.2009.36.

Wilmore, Michael. 2006. "Landscapes of Disciplinary Power: An Ethnography of Excavation and Survey at Leskernick." In *Ethnographies of Archaeological Practice: Cultural Encounters, Material Transformations,* edited by Matt Edgeworth, 114–25. Lanham, MD: Rowman Altamira.

Witzel, Andreas. 2000. "The Problem-centered Interview." *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* 1 (1). DOI: 10.17169/fqs-1.1.1132.

Wright, Holly, and Julian D. Richards. 2018. "Reflections on Collaborative Archaeology and Large-Scale Online Research Infrastructures." *Journal of Field Archaeology* 43 (sup1): S60–S67. DOI: 10.1080/00934690.2018.1511960.

Wylie, Alison. 1989. "Archaeological Cables and Tacking: The Implications of Practice for Bernstein's 'Options Beyond Objectivism and Relativism'." *Philosophy of the Social Sciences* 19 (1): 1–18. DOI: 10.1177/004839318901900101.

Wylie, Alison. 2003. "Why Standpoint Matters." In *Science and Other Cultures: Issues in Philosophies of Science and Technology,* edited by Robert Figueroa and Sandra G. Harding, 26–48. Routledge.

———. 2010. "Archaeological Facts in Transit: The 'Eminent Mounds' of Central North America." In *How Well Do Facts Travel? The Dissemination of Reliable Knowledge,* edited by Peter Howlett and Mary S. Morgan, 301–322. Cambridge, UK: Cambridge University Press.

———. 2017. "How Archaeological Evidence Bites Back: Strategies for Putting Old Data to Work in New Ways." *Science, Technology, & Human Values* 42 (2): 203–225. DOI: 10.1177/0162243916671200.

Yarrow, Thomas. 2006. "Sites of Knowledge: Different Ways of Knowing an Archaeological Excavation." In *Ethnographies of Archaeological Practice: Cultural Encounters, Material Transformations,* edited by Matt Edgeworth, 20–33. Lanham, MD: Rowman Altamira.

———. 2008. "In Context: Meaning, Materiality and Agency in the Process of Archaeological Recording." In *Material Agency: Towards a Non-Anthropocentric Approach,* edited by Carl Knappett and Lambros Malafouris, 121–137. Boston, MA: Springer. DOI: 10.1007/978-0-387-74711-8_7.

Zorzin, Nicolas. 2015. "Dystopian Archaeologies: The Implementation of the Logic of Capital in Heritage Management." *International Journal of Historical Archaeology* 19 (4): 791–809. DOI: 10.1007/s10761-015-0315-4.

Appendix A

Data Management Protocols

This appendix documents specific data collection and management procedures I followed while producing this thesis. I describe the hardware and software that I used to capture audio and video records. I also outline some of the data cleaning techniques I used make these records easier to work with.

Hardware

I used three refurbished GoPro Hero 4 Silver action cameras and a SONY ICD-UX560 audio recorder to record observations of archaeological practice and interviews with participants.

Each camera writes to a 64 GB microSD card formatted using the exFAT file system. exFAT limits the size of each file to 4 GB, so it was necessary to concatenate these files during a subsequent media processing stage (see Section B.2.1). GoPro action cameras record very low-quality audio, and this was compounded by the windy settings in which I was recording. I mounted the cameras on tripods and flat surfaces in and around people's work stations, and I occasionally affixed cameras to participants' foreheads using a head strap.

The audio recorder has 4 GB of internal storage, which I supplemented using a 32 GB microSD card. I recorded using the 16bit 44.1 kHz Linear PCM wav format, which is higher quality than the default MP3 format. I used the audio recorder alongside the action cameras to capture higher quality audio content. Although this device is not meant to recording outdoors, it was sufficient for my use case. I also

used the audio recorder without a camera present to record some interviews, in order to satisfy some participants' apprehensions about being filmed.

I used three high-capacity (4-5 TB) external hard drives to store and organise the media that I collected. I dedicated one drive as a dynamic 'processing' drive, which I used as a working directory while editing the audio and video files and while performing qualitative data analysis. I kept the other two drives as stable backups.

Software

I used FFmpeg (https://www.ffmpeg.org/) and Audacity (https://www.audacityteam.org/) to cut, concatenate, and clean the media files. I used a separate, dedicated computer to process media full-time. I automated as much of this as I could using bash scripts.

Concatenating original video records

The microSD cards on which the media were recorded are formatted using the exFAT file system, which limits the size of each file to 4 GB. The camera automatically splits recorded video into a series of 4 GB MP4 files. I concatenated these files using FFmpeg, following the standard procedure outlined in the official FFmpeg documentation (https://trac.ffmpeg.org/wiki/Concatenate).

Unifying videos using a split screen effect

I also used FFmpeg to combine the multiple perspectives captured by the different cameras into a single overview video.

Lets say we have 3 videos, each of variable length and with different start times:

- input1.mp4 starts first
- input2.mp4 starts second
- input3.mp4 starts third

The first command merges the first two videos, and produces `out.mp4`:

```
ffmpeg -i input2.mp4 -i input1.mp4 -i input2.mp4 -filter_complex
"[0]trim=0:13.0, drawbox=c=black:t=fill[delay];[delay]
[2]concat[left];[left][1]hstack[v]" -map "[v]" -map 1:a -c:a copy
out.mp4
```

During a second stage, I merge `out.mp4` with `input3.mp4` to produce `final.mp4`:

```
ffmpeg -i input3.mp4 -i out.mp4 -i input3.mp4 -filter_complex
"[0]trim=0:21.8, drawbox=c=black:t=fill[delay];[delay]
[2]concat[left];[left][1]hstack[v]" -map "[v]" -map 1:a -c:a copy
final.mp4
```

The timecodes after `trim=` needs to be modified to represent the times in `input1.mp4` and `out.mp4` when `input2.mp4` and `input3.mp4` should cut in, respectively.

This produces a series of horizontally aligned videos. The one of the right starts first, and the ones in the middle and on the left start at the specified times.

Appending black frames

Since all input videos have different lengths, the ones that finish earlier than the end of the combined video need to be filled with black frames corresponding with the remaining amount of time. Black frames also have to be inserted between segments in cases where a camera was turned off and then on again, spanning the gap in the record when the camera was turned off. This required me to identify the points of overlap between each segment, and then determine at which points each segment begins and ends. This allowed me to calculate the timespans of the gaps to be filled. Here is an example of the notes I used to figure this out:

```
2/output1 is broken
1/output1 begins at 0:00:00
3/output1 begins when 1/output1 reaches 0:05:06.85 = 306.85
2/output2 begins when 1/output1 reaches 0:06:13.35 = 373.35
1/output2 begins when 2/output2 reaches 0:04:33.65 = 274.1
break

1/output1 length: 0:06:59 = 419
```

```
1/output2 length: 0:10:05 = 605
3/output1 length: 0:17:32 = 1052
2/output2 length: 0:19:54 = 1194

1/output1 ends: 0:06:59 = 419
1/output2 ends: 605 + 647.45 = 1252.45
3/output1 ends: 1052 + 306.85 = 1358.85
2/output2 ends: 1194 + 373.35 = 1567.35

Black1 begins: 419
Black1 ends: 274.1 + 373.35 = 647.45
Black1 length: 647.45 - 419 = 228.45

Black2 begins: 1252.45
Black2 ends: 1567.35
Black2 length: 1567.35 - 1252.45 = 314.9
```

I then used `-f lavfi` to create the black frames, which can then be splited in using the concatenation function described above.

```
ffmpeg -i /Volumes/[raw]/CASE12017/June16/1/output1.mp4 -f lavfi
-i color=s=1280x720:d=228.45 -filter_complex "[0:v][1]concat" -af
[0]apad -shortest out1.mp4
```

The value following `d=` must be changed to reflect the number of seconds that need to be filled with black frames. The aspect ratio must also match the original video.

If the black frames are to be sandwiched between two recorded segments, simply concatenate the output of the prior command to the second segment:

```
ffmpeg -i /Volumes/[concat]/case1june162017y/out1.mp4 -i
/Volumes/[raw]/CASE12017/June16/1/output2.mp4 -filter complex
"[0:v:0] [1:v:0] concat=n=2:v=1:a=1 [v] [a]" -map "[v]" -map "[a]"
out2.mp4
```

Creating blank segments with just text

I found it useful to include a five second title at the start of each video to indicate what I am about to watch, and a moment at the end to indicate that the video is over. Similarly, I inserted frames explaining gaps in the video footage in cases where all cameras are off.

The following example demonstrates how to create blank segments with overlaid text:

```
ffmpeg -f lavfi -i color=c=black:s=3840x720:d=5 -vf "drawtext=font
file=/Volumes/[concat]/open-sans/OpenSans-Bold.ttf:fontsize=70:fon
tcolor=white:x=(w-text_w)/2:y=(h-text_h-text_h)/2:text='9:30 AM
break',
drawtext=fontfile=/Volumes/[concat]/open-sans/OpenSans-Bold.ttf:fo
ntsize=70:fontcolor=white:x=(w-text_w)/2:y=(h+text_h)/2:text='All
cameras turned off'" /Volumes/[concat]/930-break.mp4
```

The font file, size, colour and the text itself can be customized. The part following `y=` indicates each line's vertical alignment. The value following `d=` specifies the clip's duration in seconds. The aspect ratio must match the other video segments.

Final concatenation

After each tripartite video was compiled and clips with overlaid text were generated, I concatenated all these components together.

```
ffmpeg -i
/Volumes/[concat]/case1june162017y/case1june162017title.mp4 -i
/Volumes/[concat]/case1june162017y/out6.mp4 -i
/Volumes/[concat]/case1june162017y/break.mp4 -i
/Volumes/[concat]/case1june162017y/out12.mp4 -i
/Volumes/[concat]/case1june162017y/break.mp4 -i
/Volumes/[concat]/case1june162017y/out15.mp4 -i
/Volumes/[concat]/case1june162017y/end.mp4 -filter_complex
"[0:v:0] [1:v:0] [2:v:0] [3:v:0] [4:v:0] [5:v:0] [6:v:0]
concat=n=7:v=1[v]" -map "[v]" out16.mp4
```

In this example, each segment is included as an input file, in the order in which I

wanted them to appear in the output file. The value following `concat=n=` must be set as the number of inputs that will be processed, and must include as many instances of `[n:v:n]` as their are inputs. Note that the first input is denoted by 0 instead of 1.

Cutting audio

I cut the audio separately and then re-mapped it onto the video. I did this by extracting the audio streams from the video segments and then lining up the tracks according to the timeline originally devised to overlap the videos.

To extract the audio streams from the videos:

```
ffmpeg -i /Volumes/[raw]/CASE12017/June16/1/output1.mp4 -vn
-acodec copy 1-output1.m4a
ffmpeg -i /Volumes/[raw]/CASE12017/June16/3/output1.mp4 -vn
-acodec copy 3-output1.m4a
ffmpeg -i /Volumes/[raw]/CASE12017/June16/2/output2.mp4 -vn
-acodec copy 2-output2.m4a
ffmpeg -i /Volumes/[raw]/CASE12017/June16/1/output2.mp4 -vn
-acodec copy 1-output2.m4a
```

I also generated blank audio segments to fill in the gaps over the blank videos:

```
ffmpeg -f lavfi -t 5 -i anullsrc 5sec-silence.m4a
```

I then used Audacity's timeshift tool to move tracks along the visual timeline. I imported each M4A file one by one, and then aligned each of them based on the calculated intersections described above. There was some echo in the unified audio track when integrating overlapping audio tracks.

I exported unified tracks as M4A files, which I then merged onto the concatenated videos:

```
ffmpeg -i /Volumes/[concat]/case1june162017y/out16.mp4 -i
case1june162017.m4a -codec copy -shortest CASE1-June162017.mp4
```

If the audio is longer than the video, it is necessary to add `-shortest` before the output file name.

Not specifying an audio codec will automatically select a working one. A codec can be specified by adding `-c:a libvorbis` after `-c:v copy`.

Cleaning audio

I used Audacity ro clean the audio. This involved selecting a clip that is representative of a single source of background noise, and then filtering that wavelength throughout the entire audio file. This is not idea for audio recorded outdoors, especially in windy settings, where the noise is typically inconsistent.

After selecting the clip, go to `Effect >> Noise Reduction` and select `Get Noise Profile`, then press `OK`.

Close the noise reduction menu, select the entire video using the keyboard shortcut `Command + A`. Then go back to the noise reduction window (`Effect >> Noise Reduction`) to apply the filter based on the noise profile you just identified.

Export the modified audio as a `file.wav` (`File >> Export >> Export as .WAV`), and save it to the working directory.

Use `ffmpeg` to replace the dirty audio track with the clean one:

```
ffmpeg -i dirty.mp4 -i clean.wav -c:v copy -map 0:v:0 -map 1:a:0
clean.mp4
```

- `-map 0:v:0` maps the first (index 0) video stream from the input to the first (index 0) video stream in the output.
- `-map 1:a:0` maps the second (index 1) audio stream from the input to the first (index 0) audio stream in the output.

Appendix B

Code System

This appendix documents the code system I used to tag my interviews, fieldnotes and observations. Each line represents a "stub" or heading under which I organized open codes that I created on the fly. This branching structure enabled my coding to be succinct and extensible while also preserving the system's conceptual clarity.

As I explained in Section 4.4.1, the code system is divided into a descriptive code system that identifies relevant entities or concepts that appear throughout the dataset, and a theoretical code system that mediates between grounded observations and the theoretical frameworks I apply to explain them. The descriptive code system is further subdivided into an activity domain that articulates entities and activities identified by project participants, and a figuration domain that highlights cognitive schemes, syllogisms, and evaluatative or affective statements elicited by a speaker.

Descriptive codes

Activity domain

Archaeological entities Objects or concepts that are specifically meaningful in archaeological research contexts.

Fieldwork Used to code elicitations of fieldwork units.

Built landscapes Used to code elicitations of largely immobile entities or structures of interest to archaeologists.

Sites Broad areas where archaeological investigations occur, which corre-

spond with high concentrations of recognizable traces of past human activity.

Constructions Largely immobile entities created by humans.

Natural features The natural environments in which human activity occurs.

Finds Largely mobile archaeologically sgnificant entities that are extracted from the site for more in-depth and specialized examination.

Discoveries Novel, surprising or unexpected entities or phenomena that become evident, either suddenly or in the course of a search.

Media Means through which information is communicated or expressed.

Media properties Terms used to elaborate upon descriptions of media entities.

Visual media Media that expresses information visually.

Documents Information that is arranged in a relatively unstructured manner, using natural language.

Formatted data Information that is arranged in a relatively structured manner, to facilitate precise interpretation or parsing of values by a reader.

Actions Processes directed at specific goals. They typically involve operations performed by subjects upon explicitly delineated entities, with effects that are thought to contribute to achieving the desired goals.

Capturing Reifying objects according to a particular schema or purpose.

Modifying Making partial or minor changes to something in order to alter specific characteristics of it. Thus in modifying activities the output is different than the input.

Organizing Arranging objects in a way such as to facilitate other research activities.

Analyzing Extracting any kind of information from data, of discovering recurring phenomena, structures, groupings, and the like.

Rendering Generating an audio or visual representation from data.

Producing Generating or manufacturing something from components or raw materials.

Maintaining Ensuring the usability and value of objects, processes and systems.

Educating Teaching or guiding others.

Communicating Exchanging ideas with other people, primarily, but not exclusively, using linguistic means.

Managing collective processes Facilitating joint work on an activity or a project.

Critical engagement Expression or exploration of alternative viewpoints.

Sharing Using, occupying, or enjoying something jointly with others.

Archaeological activities Activities that are typically or exclusively associated with archaeological research.

Computer interactions Actions performed while interacting with a computer.

People Codes about human individuals, groups of humans, or social arrangements among humans.

Personal traits Terms used to elaborate upon descriptions of people.

Individuals Individual people referred to by project participants.

Project teams Collectives formed to pursue targeted work, as directed by the project scope and specifications.

Roles Positions within collective or social arrangements.

Roles by work typre Position that corresponds with delegated responsibility.

Roles by position Position that corresponds with formal rank or authority.

Roles by state of knowledge Position that corresponds with degree of understanding.

Collectives Social structures or groups of individuals.

Social groups Groups of people based on socal ties.

Local communities Social groups that inhabit and are closely associated with a specific place.

Online communities Social groups comprising people who communicate nearly exclusively using online media, in order to facilitate engagement about common interests across vast physical distances.

Communities of interest Informal collectives that share particular characteristics or interests.

Social relationships The character of social ties between specific individuals.

Epistemic groups Collectives formed on the basis of the shared intellectual interests of their members.

Schools of thought Groups who share particular attitudes or approaches to a common area of concern, often underpinned by a specific theoretical position.

Research communities Collectives centred around particular methods, tools, materials, or objects of interest.

Disciplines Academic branches of knowledge.

Organizations Formal collectives or institutions.

Museums Institutions concerned with curating, conserving, storing and exhibiting scientific, artistic or historical collections.

Universities Educational institutions designed for instruction and research in many branches of advanced learning.

University departments or faculties A section of a university concerned with a particular discipline or branch of knowledge.

State organizations Public institutions that create and enforce public policy.

Funding organizations Institutions that provide research funding, typically through competitive application and review processes.

Companies Privately-owned organizations centred on the production of good and services and which are motivated by profit.

Third sector organizations Organizations whose operations are driven by missions to enhance the public good.

Means Codes concerned with the means of productive action.

Settings Physical venues characterized by some prevalent features or conditions.

Periods That which deals with the passage and recording of time.

Phases A length or portion of time characterized by some prevalent features or conditions.

Events Discrete and specific occurences.

Pacing The speed or rate at which something happens, changes, or develops.

Communication The means through which agents align their understanding.

Methods Aspects of structured and goal-oriented action.

Procedures An established, official or predefined way of doing something.

Requirements Necessary conditions that must be met.

Specifications and standards Sets of documented requirements to be satisfied.

Tools Material or cognitive resources that subjects can use to attain the object of an activity.

Digital tools Digital systems, media and resources that subjects use to attain the object of an activity.

Non-Digital tools Material instruments, implements or resources that subjects use to attain the object of an activity.

Conceptual tools Immaterial, cognitive or theoretical resources that subjects can use to attain the object of an activity.

Factors Internal and external considertations that contextualize actions.

Norms Aspects of work that are recognized as ordinary or commonplace, to the point that they are rarely questioned.

Drivers Broad structural factors that move work along or that contribute to defining the characteristics of work.

Facilitators Factors that make work easier.

Obstacles Things or processes that get in the way of work and that must overcome in order for work to be conducted effectively.

Goals Specific objectives pertaining to an action or series of actions.

Figuration domain

Statements Declarations about the state of the world.

Distinctions Statements where someone groups or distinguishes entities as alike or different in some way.

Ideal situations Statements that describe a situation when all goes according to plan.

Positions Statements affirming one's beliefs about a particular topic or concern.

Issues Concerns about a topic of interest.

Notions General concepts.

Collaborative notions How work is offloaded or distributed across a team of human and non-human actors.

Technological notions Ideas concerning how technology works, what it is capable of, and its limitations.

Epistemic notions Characteristics of knowledge and knowledge production.

Labour notions Relating to the experiences involved in doing work.

Archaeological notions Terms used to elaborate upon descriptions of archaeological entities.

Metaphors Use of colloquial imagery to describe a situation, entity, or phenomenon.

Theoretical codes

Collaborative commitments Relationships among people, things and processes.

Credit Acknowledgement of one's contribution to a worked product.

Affect Terms that describe the feelings one experiences during an encounter.

Open Aspects of the open movement.

DIY Characteristics of improvized tools and processes.

Infrastructure The systems that mediate between local and global.

Personas General character of an individual working as part of a collective, which dictates expected behaviours.

Heuristics How a problem is understood, given character, and strategically approached.

Discourse Aspects of broad-level conversations about topics of common or mutual interest.

Learning mechanisms Aspects of the diverse ways in which people learn.

Certainty Identifying the roles that bits of knowledge play in the formation of synthetic arguments.

Appendix C

Open Data Supplement

Appendix C contains sections of transcribed interviews referenced throughout this dissertation. References are ordered by case and by the order in which they appear in the dissertation. Each reference has a prefix corresponding with the case to which it pertains, as documented in Section 4.3.3.

Case A

A1 Basil: Well, when you make your application for an excavation to the fieldwork committee of the [research institute], who basically act as the mediator with the [national] Ministry of Culture, they gotta make sure it's up to snuff, quality wise. They don't want problems in terms of wasting a permit application because it gets rejected by the [national] Ministry of Culture because it's not umm professional enough, or it's asking an inappropriate question. And so, in, one of the things we're required to do is list our personnel. So in listing our personnel obviously that's gonna dove, you try to dovetail as best as possible, with like, these are our research questions, these are the methods we umm aim to employ to answer these research questions, and here are the specialists who are capable of wielding those techniques. So an issue was like, you know, the soil science, the micromorphology, the umm uhh, the absolute dating, umm and you know, fieldwork specialists, umm faunal, botanical, etc. All those things that one would imagine that one would find, or one knew damn well one was going to find based on what we've done with the survey. And some of this was relatively abstract in terms of like, struck up a relationship with Roseanne [unclear] having

never met her, I still haven't met her, but notionally she's a member of our team. I also initially put down names of two laboratories that we were intending to work with for absolute dating. After working for over two years I finally met Clifford from [redacted] who's doing our, who's doing some of our OSL dating, I initially put down that we were gonna work with the [redacted] laboratory for our radiocarbon dating for our C14, I will now strategically change that because [redacted], one of our main sponsors, has a special deal with [redacted], so we can get half price C14 dates, so I will flick that, so next time the document goes across the desk of the [research institute] and the [national] Ministry of Culture, that team connection rather than the team membership will have changed.

A2 Basil: We umm, I think, I would like to think that we have navigated that debate quite neatly, and I think that's a reflection of the fact that we got the grant. Initially, when we were dong the survey, we got all in the tears about this whole sort of Neanderthal seafaring thing. But then, well basically the way I wrote the grant, was to try and set up a win-win strategy. Which was basically, okay, umm, on the one hand, if we can prove umm that Neanderthals were coming at a time when the sea was sufficiently high that at least some limited seafaring was required, then that would be a huge deal, okay, that would be great. Conversely, umm if these were, if there were periods of umm major land bridges and this was something that had really only been talked about since an articles in 2009, a [redacted] geo-archaeologist called [redacted], published a new series of paleogeographic reconstructions of the [regional geological formation] going back to about 450,000 years ago. He suggested that at certain times in the Lower Palaeolithic and the Middle Palaeolithic that it was almost certainly possible to walk pretty much from western [neighbouring region] to [other neighbouring region], through what today would be the [regional geological formation], and largely a seascape. The significance of that was because until relatively recently umm, a, the [region] was always thought to be relatively wet, and by extent then a barrier because everybody pre-Homo sapiens was then pretty terrestrial, whereby [neighbouring region] was not really a very interesting place for Palaeolithic archaeology anyway, it's like, because again, a lot of people get sort of, just as with some Neolithization, people get very pent up about earliest, so if you're looking for the earliest peoples moving into Europe, and people do look for this even though Europe is a completely ridiculous concept when dealing with the Palaeolithic, then you out your energies into

[other neighbouring regions], you know. So if you do, if you're going to work in [our region] you go north. And indeed, there was umm, Aeris from [redacted] for a major European umm grant basically looking for the gateway to Europe, and she was just, she was putting all her energy up there. So what we did was we said, given the recent evidence for pre-Homo sapiens seafaring, it may be quite possible that we, that [our region] was part of the story, but we need to get absolute dates to show that, so we'll make a contribution to this. Conversely, if we show that the people were coming only in the times of the land bridge, this then raises the profile of the [regional geological formation] with regard to an alternative route for the peopling of Europe or the dispersal of hominins more generally. Win-win. So we categorically didn't lead with we're going to show that the Neanderthals were seafaring, we were like basically, if you give us the money to excavate and date, we can shed light on either of these, and both of them are fantastic.

Zack: Both of them have the outcomes, yeah...

Basil: Yeah, so. So, certainly we are interested in contributing to the Neanderthal seafaring debate, but we've been very careful [and I think because–

Zack:] and that there is a lead in...

Basil: But we've been very careful in how we've structured in, whereby people are like yeah, great. If you get dates for this it's gonna be this or that, and both are fantastic.

A3 **Zack:** And how much consulting do you do with other people in the project?

Basil: The last couple of years, I mean the fact that we get, that some of us get to go out in umm February, so on our, I mean this year, on arrival, I had a fairly clear idea as to where I wanted to sample. Umm some of these were like, these trenches we dug last year that were unfinished are worthy of putting energy into, we need to finish them because of these research reasons. So trench [redacted trench ID], we were always going to finish. We never went back to trench [redacted trench ID], [redacted trench ID], sorry [redacted trench ID] or [redacted trench ID], umm because as soon as we had access to new plots of land, umm, they became too close to each other. [redacted trench ID] and [redacted trench ID] can kind of represent the geoarchaeology of that area, now we need sort of like middle slope, toe slope, or some of the trenches were targeting areas of interest based on what we found on the survey. We found a lot of middle, you know, one of the reasons I've been wanting to dig in front of

rock shelter A where Lauren and Theo were digging is because we found this fabulous material that we thought was Levallois, we still think some of this is Palaeolithic, but some of it is bound to be Aurignacian, Lauren's stuff. Those trenches were very deliberately put there because that's where we found, sort of the enormintantly cool material that I thought was Middle Palaeolithic, and the Middle Palaeolithic was very poorly represented by the excavations that we've dug thus far. So umm, then when we got there, at the— Alfred and I went over I think, you know, sort of on the Sunday, before we started on the Monday, on the Monday, we then, it's like okay, where exactly in this space, you know. And also, last year, I knew that I was putting a lot energy into getting access to that plot of land, so last year Gabe, Alfred and I made time to go over to that area, and said like ideally I want get permission to dig here, in which case where do you think we should dig? So we had already talked, discussed and mulled it around a little bit. Umm, and so I think pretty much everything day 1 was relatively well worked out. There was a little bit of like okay, Lauren we want you to dig in this area here, you can, you know, you know, I didn't say this exact 1-metre square but like we want you in this area here. So there's a certain amount of umm...

A4 **Basil:** I've always worked at other people's projects, which mean that they had the headache of sorting out the meals, the equipment, the permits. And I could have quite happily plotted on doing that, but then, you know, there was things that I was interested in that weren't necessarily being answered by other people's projects. So I decided I would dip my toes into the directorial world, and I deliberately chose umm a very small project, you know, it was only meant to be a three year survey, and you know, surveys are often sort of at the regional scale. I chose a hill. It was like, you know, this is fairly sort of small scale. And you know, I basically...

Zack: Why [this site]?

Basil: Well, that's a different question. Um, but...

Zack: We can get to that after.

Basil: Yeah, but you know. It basically was like, let's see how it goes. You know, I'm not investing potentially, I'm not committing to a huge amount of time here, and if I spend my entire time being a director, arguing with land owners, rushing to hardware stores, battling with bureaucrats, and not being in the field, then maybe I won't carry with this, and I'll go back to my world of

working for [several very prominent archaeologists and archaeological projects]. I mean, really, you know, I've had a pretty good gig up until now.

A5 **Basil:** And then there are those more sort of umm conflict management I guess, which is where you have, and usually this tends to correlate with relatively junior scholars, who don't have the security of a job or act more insecure in terms of like their progress, their knowledge and whatever, where it's like we have, I mean basically, you know, to a large extent we're all working, most of us are working with stone tools, and a whole bunch of others are working with soils, so it almost boils down, most of the archaeology, to two components. And yet we have more than two people working on them, which means that we have people who are ideally complementary in the information they're pooling for the project, but I'm also very aware of the fact that while people are inputting to the project, they kind of need their own datasets, there needs to be a bit of a boundary marking in terms of this is ultimately mine, and I will be publishing this. Or at the very least, I will be publishing this as the first author, with this person. So, and I've experienced a lot of that at [a prior project], and so it, for when you have these little flare ups, it's not something that, none of this surprises me. As to how one deals with it, I've never been in that position to actually have to mediate these sort of things. So I've learned, probably, to be more clear up front in terms of this is my expectation of you, what's your expectation, this is yours, this is common, you know–

A6 **Zack:** Uhh in your view, what are the main challenges or considerations in managing information productively for archaeological... can you just mentioned an aspect of that?

Basil: Sorry, managing...?

Zack: For managing information.

Basil: Umm

Zack: In archaeological, which may involve fieldwork or other aspects of work.

Basil: Umm, it's, part of it is actually sort of umm, a combination of trust and communication, and occasionally a bit of coercion. There's, my particular role is to like, you know, you let certain people, you're bringing people who you believe, or know, can do their job, and that job is often the generation of data that's pertinent to answering your research questions. Umm, and different people work in different ways. Some people are very gregarious, other people are like hyper paranoid about keeping stuff, and you just gotta, you know, as

long as there are deadlines and you need communicate how you're gonna need the data, which again, that's a steep learning curve, often at times you just assume that by osmosis somebody is gonna know what you're gonna want by the end. Umm, and you know. And now I'm coming to appreciate that, you know, there's a greater degree of me being hands on and centralized, and it's like guys, everybody has to work in this particular system. You know, your end products will need to be coded and accessible in this particular way. How do you get to generating those data? That's your skillset, how you work, fast, slow, you know, et cetera. That's up to you. But ultimately we're gonna need an artefact ID system. However you deal with your pottery otherwise, or your ceramics or your ground stone, you are going to need to interact with this point. Umm, and, you know, this is a new project, a number of us are young scholars who– yes, we've all worked on other projects, but you know, more often than not those projects have their own systems, so it's a matter of like, you know, figuring out, you know, what we need. And some of this is probably gonna be question-led. Other parts of it is just like no, this is just, this is what everybody does. And other parts of it might be from external forces. You know, it would be the, the [national] Ministry of Culture requires us to provide an inventory of our crates.

A7 **Zack:** What do you consider the most valuable skill, that an archaeologist can have?

Theo: I don't know, how to wield a shovel and a mattock. That's always a valuable skill. Like be able to identify something. Figure out what's going on, dig it, and then accurately record it.

Zack: Alright.

Theo: That's the...

Zack: That's a series of skills.

Theo: That's the essential... like the essence of archaeology. It's just like, you don't just sit behind a desk and write little reports and stuff. It's like, without, you can't, you can't do that without actually having dug before. It's im– It's important to know what the process of excavation is, in order to understand how, like, what's going on.

A8 **Zack:** So uhm, can you please describe your specialization or expertise, if you consider yourself to have any?

Lester: Uhm, well I've been working professionally in excavation, excavations

for about three years now so my expertise comes in in actual fieldwork rather than a specific discipline

A9 **Lester:** Well, I think it's important that people come away from this not having been trained in the trench, given a pickaxe and told to dig and get on with it, you know.

A10 **Theo:** It's a way, it's like, I respect people far more if they've done their BAs and MAs and then gone dug for a little, for a long time, and figured out what they want to do, and then they've done the PhD, and it's like, huh, okay, so you can dig, and you also, you've also now specialized in this thing. It's like, yeah.

Zack: Huh. That's very–

Theo: It has not [unclear]. But then you get all these academics that, you also get PhD students that are freshly graduated, that come into commercial and think they know everything, and it's like, you know nothing. You literally dug research sites, which is cushy compared to commercial, they don't have the pressures, they have their, sort of, limits. So.

A11 Had a brief convo with Olivia as she was cleaning up, when the corner cam died. I really [....] by the mic. It was about focus, [awareness?] of one's surroundings, being in the moment and focusing on the task at hand. Focusing on the little things helps her keep her organized. It is an active strategy in use. She hates that although excavation is manual labour, it really requires you to actively think. You can't just phase out – [illegible sentence]. I mentioned my tendency to compare excavation with tunnel vision, and noted how I think it is somewhat flawed. She asked me if I played a musical instrument, and I said no, and then asked if I could relate to that. She compared these activities in order to convey the sense of being in the moment, facing a task at hand, dealing with what is immediately in front of you, literally and figuratively, and the satisfaction of achieving one's goals and ticking off all the boxes. She likes to set goals, for herself and for others.

A12 **Lester:** So, our first week was tough. Very, very tough. We had a very uhh difficult trench to excavate, very hard layers that were very difficult to physically excavate. Uhm and I can dig for a certain extent, for a period of time in quite hot weather, I'm used to this, for this is not a problem. But I see people that have never approached this, attack it physically, really really attack it

physically, and not bear in mind that this is actually really difficult. And it's not a physicality thing, it's a, it's a thought process. So it's uhh, yes you're physically able to excavate twenty centimeters in a day, but how are you going to feel at the end of the day? Are you going to be able to identify the context while you're doing it? It's better to excavate ten thoroughly than twenty in a hurry, you know? And, but the speed will come with time. And so I've noticed this with Morris particularly, he was quite, he's a very able archaeologist, a very good digger, uhm but physically he's changed the way he approaches things, so he won't go full-on that [unclear] now, and then expect to be able to do it again the following morning. And then equally, the understanding is growing, so like contextual change, uhm, I've really struggled to try and integrate teaching into my methodologies on site, because that's not my skillset, and not what I'm used to. But now I think we've finally figured it, I'm involving him in the paperwork a lot more, making that a part of the teaching process, a bit more. I think it's beneficial.

A13 The other cam is on Morris' head as he clears and gardens to set up a new 5x1 trench. [...] Comment: "it is a weird trench" (Morris). Slightly rhomboid, not as square-angled as intended. Morris "catching on" according to Lester after he asserted / referred to the controlled environment that we constructed. One wall is extended 10cm out in one corner, a mistake attributed to marking the rectangle on the steep slope, lengthwise downhill. Morris also joked that the error might be corrected by sloping the section by 10cm. This also contributed to Lester's comment on Morris' "catching on". He is confident enough to joke, and for the joke to be a good one, no less. Also interesting how the work space shapes the trench. Supplies used to delimit the trench are put on / near a rock in the corner. A clear space devoid of rocks is needed. Supplies placed in the corner, on the rock, mark a boundary. They also necessitate some clearance, 0.5-1m between them and the delimited trench. Spoil head location is in the bushiest part, where the cleared grass was placed. More room on small side for sieve, but more land can be cleared too. [...] Lester is thinking about where to put the spoil heap. My earlier notes were of passive and seemingly assumed locations. It turns out I was correct in my assumptions pertaining to where the spoil heap would be located, and the reasoning behind its situation there.

A14 **Ben:** I think just sometimes, like, I've become too self-aware, and I get in my head sometimes.

Zack: While you're digging?

Ben: No, not while I'm digging. Because while I'm digging I'm like generally busy, and I'm like, like listening to music or whatever,

A15 **Zack:** Have you questioned any of the methods you're using? Like internally but you've been afraid to ask.

Jane: I think the biggest thing that surprised me, and like now it kinda makes more sense, but I was like, I wasn't the first person to start digging, obviously Basil did first and then I kinda just like watched what he did and then I started digging, and he was so rough with like the context, like he just went at it with a triangle and then like with a pickaxe, and I was like, like I pictured archaeology like, so meticulous and slow with like a little brush, like I don't know, like I guess maybe with like bones and shit you would do that because they're more delicate, but I was like oh my god, like he's just breaking it up, what if there's something delicate underneath? Like, that really took me back.

Zack: But now I see you just going through it.

Jane: Yeah, yeah, now it's like, I guess cause they are...

Zack: What changed your mind?

Jane: Cause I just realized there's like tools that have survived thousands of hundreds of years. So it's like if they can survive that then they can survive like triangles going through it, you know? So might as well go quickly. But I think that was the kind of thing at first that was like, what? This is kind of weird but okay.

A16 **Ben:** But I don't, like the paperwork and all that, like I'm not like, I'm not, I'm not one to like be sitting at a desk just writing all day. Like, I like to be in the trench, I like to be doing something physical and like engaging, right? And I don't, like reading and like articles and like scientific research and stuff, just like, it doesn't interest me, like that much. Even like, I have to be engaged in the topic, you know?

Zack: Yeah, yeah. I feel like you and Theo have a lot in common.

Ben: I think so, yeah. Like Theo describes himself as like I dig holes, and I'm like yeah, I can relate to that, man. Like I dig holes too.

A17 **Zack:** So umm, I guess I've already got your bio and all that. But I'm wondering if you could reiterate your overall objective of your work. I mean how your work contributes to [this project].

Theo: Umm, the objective of my work...

Zack: Or of your contri– or of what you're doing here.

Theo: It's to dig holes. Dig holes.

Zack: So maybe a way to get a better answer, can you tell me about the current season and what your current plans are, or have been?

Theo: For this season I've been digging a big hole. Yeah, we aim to finish it, but I doubt we will.

A18 **Zack:** How does the feedback you get from Jolene and Agatha and Basil and Alfred help you when you're doing it on your own, or when you're starting from scratch, when you're starting your own trench?

Theo: It just gives you an idea of what to expect. I mean not necessarily with the lithics, but with Basil and Alfred knowing the hill so well, they know what they want and they know what they're looking for. For example, when I was working on [redacted trench ID], Basil wanted, the point of that trench was to look for Mesolithic stuff, and to try and find stratified Meso, so umm that, so Basil explained that to me and then I knew what I was looking for. I knew that I was looking for microliths, predominantly, maybe the whiter, the bright white chert, rather than–

A19 Liane got in to plan the micromorph sampling. She and Lauren looked at the section, pointed at levels, indicating which should pertain to each context. Repositioned myself to better observe Liane. She is actually 'carving' (my own term, not hers) a block using a flat metal instrument, I believe the metal inside of a trench handle, which is embedded within the head, that was broken or taken off [illegible]. Liane returned back with mallet and chisel. Others had to get out of the way so she could proceed. Liane also applied gypsum plaster to the micromorph sample. Apparently this one took longer to define than the others. She will return tomorrow to chisel out the sample and apply gypsum plaster to the internal face, and label it all up for further analysis by Alfred. It needs time to dry, for now.

A20 Small discussion with Lauren and Ben about the tools that archaeologists use, after I picked up the triangle and repeated a tidbit I heard from Basil that it is supposed to be used for wallpaper stripping. Ben noted that they were extremely useful, and was surprised that it was not used primarily for archaeological purposes. Also that they are exclusively used in [the region] due to the

rocky and baked soil.

She then demonstrated how difficult it is to use a trowel in thus environment by showing how it would be typically used on a particularly flat surface.

A21 **Zack:** What do you think of people like Dorothy, who aren't necessarily working with you?

Ben: What do I think?

Zack: Like have you asked them about their interpretation of your stuff. Do you think that would be helpful to have?

Ben: I think Dorothy is a little bit different, just because hers is like very, like she's working on micro remains and like macro remains, or like...

Zack: Botanicals.

Ben: Botanical stuff, right. So her stuff is like coming out of the soil that I collect. So there's nothing I can do to effect the amount of stuff she's gonna find. So while it's cool if she finds stuff from my trench, like there's no way that I'm going to effect it and there's no way that she can effect me in finding uhh. I would like to know more, I guess I should also ask her, but I think it's a little bit different because we're not interacting directly with the botanical remains.

A22 Theo changed sections, and I found the [illegible word] that followed very interesting. After hammering in the rebar and vertically aligning the string, it is only level at a point that is higher than the rebar. He told me to go grab the other rebar in the corner, though it is massive. Tried hammering it in, but it was clear that it would get blown over by the wind. I offered to hold it steady but instead he told me to rummage in his bag and find a nail and masking tape. He attached the long nail to the rebar, adding 4-5 inches to its length. He then proceeded, with my assistance, to tie the string around the nail, clip it on securely, and secure the line down with a rock. Regarding securing the line down with a rock, this was a challenge for me yesterday, as well as when I did this for the earlier section this morning. I needed to find the right kind of rock, which was not too big, but still dense. It needed to be not too rough, but with sharp angular corners. This was never made explicit; after two failed attempts, first with a large rugged rock, and then with a smaller, less rugged rock, he picked up one and gave it to me, saying "something like this". I wound the string around it, leaving some slack, and then positioned the rock in a way that would render the line taut, by rotating it or securing it around others.

A23 **Zack:** What would distinguish the field director, though, in your view?

Basil: Umm, the field director gives guidance, umm whether asked for or not, in a way. They are there to sort of help direct, make, you know, they are the person if you're uncertain about something, they're there to make the call in terms of, yes, change context, no, don't take a sample there, etc., etc. That they they have a greater knowledge and experience of the recording system and understanding of the project design, et cetera.

Zack: Yeah.

Basil: But I think, you know, I mean, both Talia and Alice were relatively junior. And, you know, there was a couple of hiccups last year. You know, Talia diligently took photographs of all the x finds, but they were all right up close and personal, so it was like you can't... It was like part of the reason to take a photograph is to get a context. So it's, so we need to go back and remind people, or remind ourselves about the nature of recording, what we're doing, what we're trying to achieve here.

A24 **Zack:** Mhm. So I may want to shift gears a little bit. We've talked about how this work fits in with the broader world of Palaeolithic archaeology in [this region] and elsewhere, but maybe I want to, I want to talk a bit more about like your work here at [this site], on a more practical scale. Umm, because I mean, I see that you're very logistical in planning how this fits in to the other stuff. But like. So I'm thinking, so, I know, I've never seen as much director in the trenches, but how do you sort of manage these two different worlds, of being the logistical manger in a way, and being like in the trench. Like are there different caps, different mindsets, is there a different, what sort of differences or similarities exist, if there are any?

Basil: I mean, yeah. I think when Richard visited the other day, he said that he never excavated he didn't quite know how I did it. Someone like [prominent archaeological theoritician], never in the trenches, you know.

A25 And yesterday was the first time when I was really dragged off site for any significant amount of time. We had important guests that we wanted to share information with, or extract information from, and I was required to be off site for most of the morning. Which was, I was a bit antsy about that, but I have good personnel on site.

A26 **Zack:** So does Basil as a lithicist get involed in the lithics analysis, or is he

more like a director or a boss?

Jolene: No, he's involved

Agatha: Yeah, he wants the feedback, he wants to discuss things, he wants to take a look as well

Zack: Of course, yeah

Jolene: He doesn't ask like some sort of boss who just demands, he's participant

Zack: Yeah I love that about being in the field with him, like he's always in the trench

Jolene: Well I feel like he really likes to you know understand the completeness of the site, the whole aspect that why he's digging, I was always advising him to stop digging and to come to the museum because you know he had field directors and I think, I thought he was wasting his time doing it himself. But okay, he stayed in the field, that's not a problem at all and uhh he's only in the museum during the study season but we discuss a lot anyways, we discuss stuff everyday so

Agatha: Yeah he comes with the material

A27 **Zack:** Is it very different now when you're a field director, or assistant field director? Is it, do you see your role as very, or do you see the site very differently?

Theo: No, not really. I mean you have to

Zack: Do you see the archaeology very differently, like the trenches themselves, and the material coming out of them?

Theo: No, not so much. You just, I suppose you're more aware of the progress that's been made, you're aware of the archaeology that's going on, because well you need to be, to be able to help.

A28 **Theo:** Well my role as field director is far different than Alfred's or Gabe's.

Zack: How so?

Theo: Because I'm just there to make, basically make sure nobody dies, I think.

Zack: You're the adult on the hill.

Theo: Not really, because the others, Talia and Alice, are well– far– responsible... words... But yeah, they know what they're doing. I don't really need to supervise them. They've been here, like Alice's been here just as long as me, but yeah.

Zack: Okay. Do you–

Theo: It's just to, it's just that I dig all year round...

Zack: So you have the experience and the know-how...

A29 **Zack:** How did you, uhm, become involved with [the project]? Because it seems like–

Lester: So, Theo came here last year, and I worked with Theo in the UK on a commercial job, he was on my site, I was the assistant supervisor on that commercial site, and he worked alongside me uhm on a road project which I had been part of for six months, and Theo came in for a month, and then left and we missed him haha, but no but we stayed in touch. This is the first time I've seen Theo since that job, was here. But we've been in contact since, and he'd put me in contact with Basil so I applied through that, and got the gig.

A30 **Zack:** So, umm. How did you get involved with [the project]?

Lauren: I met a friend of Basil's, who is an archaeologist in Berlin. She had a postdoc fellowship there. And I got to know her, I got involved with her project on [another area nearby], and she knew that I was interested in lithics and lithics studies, and told me that she had a friend who had a project on [our region], and put us in touch.

Zack: So you worked [in the other area] with her before?

Lauren: Yeah, last year.

A31 **Ben:** I wasn't expecting to be a supervisor. I... like I wasn't expecting it, but I wasn't going to be surprised if I was promoted to supervisor. Umm I know last year people kept on asking, like Sam would ask me, and like other people would ask me, if uhh, if like, if I wanted to learn more, if I wanted to like sort of be in a supervisory role, and I was like yeah, if like you guys want me in there like I'll do it but like I didn't really care. I think this year was more like, just take the supervisor role, roll with it.

A32 **Zack:** What do you think the benefits of being a supervisor are?

Ben: More experience, hopefully if I do well people will see me in a better light or whatever. Umm, yeah experience and like if I move on further in archaeology I'll have this experience of being a supervisor and if I did well I can say like, oh look I did well in my second field season and I was a supervisor, so.

Zack: Working your way up.

Ben: Yeah, maybe

A33 **Basil:** You know, Morris and umm one of the [local] students working with

Lester in that first week in that god awful trench—

Zack: It was [redacted trench ID].

Basil: [redacted trench ID], whatever. They were on their own. They didn't get to chat with anybody else, umm and the archaeology was, it was baked solid, it was hard, and there wasn't much in it, it was awful. But you know what? It was like taking one for the team. You know, and I did feel bad, and I probably shut down that, I was looking for an excuse to shut that trench down as quick as possible, because I knew it was gonna be bad for their morale. But at least David won't turn around and go, hey I paid all this money...

Zack: Well Morris grew a lot, throughout the entire thing...

Basil: Yeah, and one of the reasons he did that, like, I heard about [unclear] from him or, you know, what pissed me off for the first week, or what really got my hankles up, was like, rumours going around that like Morris in particular, the logic was like, if we get all the lithics washed by Friday afternoon, does that mean we basically have all Saturday off? It was like in the first two days, he was looking to try and shortcut, get out of work, and like, and my attitude was like, guy wants to go to the beach, well he could leave the project tomorrow. Umm, he had a number of things going on, and he got better during the year, because one of the ways I kind of called him on it is I gave him more responsibility. So by the end, I think, and then he became invested. He had responsibility, he was running a trench.

Zack: And he did have some experience before too, so...

Basil: He did. So it wasn't a complete, you know and I played this up, when I tried to... You know, you have to be careful to play people up and above other people. But like, you know, I elevated him because he did have more experience, and because also I wanted him to calm down and take it seriously. And he did quite well. Uhh, so, a lot of that is quite carefully thought through in terms of like, that's also why I want to avoid the field school project, because then you have good people being potentially entitled feeling ripped off, in terms of why is that person digging on the shady side and I'm always in the sun?

A34 **Zack:** Okay. Umm I've noticed that you tend to, like last year especially you were, you had like three trenches going on at once, right. And this year you're very much focused on one trench, [redacted trench ID].

Theo: Yeah.

Zack: What style, like what kind of, do you prefer the former or the latter?

Theo: I don't really mind. Like, if I have one trench I can focus more on it, but having three means I always have stuff to do. Like there's always, so if somebody is digging in one trench and somebody else is sieving then I can go dig in another trench. It means I can dig, which is what I, which is what I like. I've barely dug this season.

Zack: Yeah. Do you umm, has it always been this ease to sort of go around different places?

Theo: No, I still don't think it's that easy. It's, yeah. I don't know. It just takes years of experience.

Zack: Mhm, alright.

Theo: I mean, eventually you'll get confidence but it's like, you sort of have to project confidence rather than

Zack: How did that–

Theo: Not necessarily what you're doing.

A35 **Zack:** So I'm not really, like I'm not really as privy on the details of that. Can you briefly describe specifically what the issues were?

Theo: It was just that it was dug poorly.

Zack: How do you mean?

Theo: Well it was like they just went down, they didn't give a shit about the sections or the recording so much. The recording, the more I've done it and looked at it, the happier I am with it.

Zack: From last year's?

Theo: Yeah, from last year.

Zack: Why?

Theo: But it was just initially it's very much like minimal recording. There was minimal recording.

Zack: Why was that gradual, why the more do you look at it the more–

Theo: Well because I have, over the season, gotten more of an understanding of the trench. I've been thinking about it far more, and working out what's going on.

Zack: So that minimal recording sort of made sense as you sort of got to know it?

Theo: Yeah.

Zack: Huh.

Theo: But I mean it could have had more recording, but I mean the bare

minimum that was required.

Zack: Can you give an example of that kind of uhh, that kind of poor recording that eventually grew on you? Or that you eventually came to understand, perhaps?

Theo: I don't know. If you go to the other ones

Zack: If you go to the what?

Theo: The more complex stuff, the fact that it, last year it was five lithostratigraphic units and now I've just three.

Zack: Mhm.

Theo: And one unit is just one big mess. It's quite nice. That makes, I think, the mixture of poor recording and over-complicating stuff, that made it difficult to understand to start with, and poor digging.

Zack: So how did he overcomplicate things?

Theo: He just like–

Zack: Did he just like split instead of lump?

Theo: Yeah, he split stuff and used terms that he didn't quite necessarily understand. I don't understand them. I made, I got Alfred to explain it to me [unclear]

Zack: So, in your view, what sort of, what could have, how would you have avoided this if you were digging that trench last year? How would you have avoided these issues? Or were they avoidable at all??

Theo: Yeah, you could have recorded it better. He could have written more. Had a more thorough notebook. Not– I'm pretty sure one of the contexts was made up.

Zack: Cleaning context?

Theo: No, no.

Zack: Not even?

Theo: Right in the middle of the season. The only record of it is the context sheets, but yeah. I don't suppose we should actually really talk about all that.

Zack: Okay.

Theo: Like, in honour of professional standard.

Zack: Well that's what I'm hoping to understand.

Zack: We could, we could.

Theo: For the integrity of the project, we shouldn't really talk about the fuck ups, really, should we?

A36 **Theo:** Yeah. She slept in my bed for the first, like, two weeks.

Zack: But you got no sleep.

Theo: I got like three hours, it's enough haha.

Zack: haha. I was also listening to your interview, uhh the previous one, and you mentioned something about you get, you're out in the trench more, for more hours than you're in your bed.

Theo: Yeah, probably.

Zack: It pretty much just sums it up.

Theo: Probably. Because trench is life, isn't it.

Zack: Yeah?

Theo: Yeah.

Zack: So umm.

Theo: I spend more time on site than anywhere else, like.

A37 **Basil:** I mean that, that's the, on the one hand I'd be perfectly within my rights to just like, okay I'm feeding you, I'm watering you, just do your work. But you try, I mean obviously...

Zack: You be diplomatic...

Basil: You wanna be diplomatic, and you know, a happy team is a productive team. Umm, and so, you know, a lot of the time, initially, and I think initially my view was I was going circulate people more, and then I would see that there were some very good working relationships building up. Don and Alice got along phenomenally well, Ben and Eve, umm uhh Alfred and Maddie, umm and those people I saw more because they were on my side of the hill. But then, you know, one of the big things was like, it was blazingly hot on the other side, it was tough for those guys, we eventually got the shelters put up—

Zack: At the same time, I noticed that those things bringing people together, in a way.

Basil: Yeah—

Zack: But it could also run tempers high.

Basil: Yeah, I mean, but like there would be little things like, you know, the peers I would give everybody at the end of the work week, the people on the shady side got the small beers and the people on the sunny side got the big beers. You know, it was an acknowledgement that these guys are having it tougher than you guys.

A38 **Basil:** But then, you know, the undergraduate, the junior team members, upon

whose backs we often do our work, this year for the first time, because I, as we have greater exposure within the university, we have more people who are interested in coming

A39 Basil: but I worked with a lot of academic departments, which worked in the same way, and they used students as labour.

A40 Ben: the two trenches that I had been in previously were uhh [redacted trench ID] with Eve, and [redacted trench ID] with Lauren. Both of those trenches had already been dug by the time I got there.

A41 Zack: Umm, have you worked in other settings? Like you've worked in the museum, right? Just lifting boxes, right?

Jane: Yeah. But...

Zack: Yeah. And you've just been in the field I guess, right?

Ben: I've been in the museum twice. I've lifted boxes like Jane. I've also done the counting and a bit of lithics washing in the museum.

Zack: What did you think of it?

Ben: Umm, you wanna go first?

Jane: Not my fave, to be honest.

Zack: Yeah.

Jane: I just, like, I don't... maybe if I knew more about what I was looking at then I would be more interested. Like I'm sure if it was like a bone lab I would love it. But it just like, lithics are cool but they're not really my jam and I don't really know what I'm talking about, so like, working with them is kind of like, it's like counting rocks. You're required to count like scapulas and unclear

Ben: Yeah. I was basically the same way. I found it interesting at first for a little bit, and then it just became monotonous and like boring and just mind-numbing, basically. And the thing you said about, just, you don't have the expertise in it, I felt the same way. Like I was just looking at lithics or rocks that I would have picked out, and I can't say like, oh this one is definitely not. So I'd be like, oh, Agatha, is this something?

Zack: I actually haven't taken a lithics class yet, or at all.

Ben: Well I'm planning to next semester, next year, but I had to–

Zack: Was it because of this project, or no?

Ben: Yeah, basically. No no, it was, for sure. It was because Basil, and I have some experience with it so I'm gonna do better, hopefully.

Jane: Hahahaha

Ben: In theory.

A42 **Basil:** And you know, one of the critiques I'd point out to people is like, in terms of like, sucking it up was to reflect on my experiences as an undergraduate, whereby usually, I went on the Laconia survey I worked on, there was basically one undergraduate from Nottingham, and one undergraduate from umm Amsterdam, and most projects were made up of PhD students, postdocs, young scholars and professors, and then you would make space for a couple of lucky young undergraduates. And those lucky young undergraduates, you were a lucky young thing to be allowed on to this project, it was a huge opportunity, you took it really seriously, and yes, you were like the lowest rung, you would be washing uhh the bone, you would be marking the sherds, that's the tradeoff in terms of you're gonna be fed and watered and you get to work on this fabulous project...

A43 Camille was kind of disappointed with how mundane the work was, especially at this point in the season. She was just applying rubbing alcohol to plastic bags to remove markings so they could be reused. This task was also later assigned to the undergrads during work hours, but I was too busy in the dig house to hear their reactions, which were likely more like complaints.

A44 **Zack:** Did you feel like there are, like, problems, with communicating, in terms of like understanding, sort of the things that like Alfred was getting at? Or like, if there were any issues in like, uhh, comprehending something that eventually you sort of learned, or were there any sort of challenges in that sense that you had to deal with? Do you recall any examples like that? Especially maybe in the beginning.

Jane: I think for a geology it's best, especially like if you do a couple of geology courses, it's always hard to like train your eyes to see certain things. Like sometimes Alfred would like take out a handful of sand and go like do you see the red flakes? and I would be like no. Or even like, pointing our stratigraphy, like see how this changes to this level, and it just kind of, training your eye to see what they're seeing is, sounds like an easy thing but it's actually hard to like, kind of, pick out things that they want you to pick out. And I think like now it's easier to like, oh, see how that's transitioning, or like, umm, even just like comparing peoples' trenches and like the contexts they're in, it's

easier now but at the start it was like, it looks the same to me, or like I don't spot what you're spotting, you know? And it's just a way of looking at things that I think that's the hardest part for me.

Zack: Do you know how that developed?

Jane: I think just like repetitive, like every day, looking at stuff, I think is like, just a good way of learning. I don't know if there's something specific but... and just hearing from like, hearing Alfred pointing it out, hearing Basil pointing it out, hearing different supervisors pointing it out, it was just different ways of explaining it or showing it to you that it starts to kind of, like, produce a form of knowledge. Umm, but I dunno.

A45 **Lester:** And that was the time I really kind of got into excavation as a concept. So I did that on my first year. In my second year, I [unclear] community archaeology, and then [redacted] field school. [redacted] field school is a big part of [redacted] University's training program for their students. I didn't receive enough excavation experience in my own degree, so I went and applied and volunteered on that excavation, and then my third year I went back to the same excavation at a supervisor grade.

A46 Richard on site. Just had a brief discussion of palaeofauna, following earlier discussion about [the region's] fauna on Basil's Corner session. He has now gone to east side. ... Richard is an old friend of Basil, who has an extensive background on the [regional] Palaeolithic, particularly in [a neighbouring area]. He co-directs a project that Alfred is using for his research. Described by Basil as not a material culture specialist, but extremely well versed in the background of the palaeolithic archaeology of Europe.

A47 **Zack:** What makes this unique?

Agatha: It doesn't, nothing [unclear]

Zack: If you [unclear] There's nothing unique about the apothiki?

Agatha: The place? No, except we share it with [redacted].

A48 **Zack:** And uhh, the music is a thing, it frames the mood. I'm trying to think about time and how it frames the day. That's a bit of an idea that I abandoned and that I want to come back to later on. You know, sort of, so I need to observe that earlier on in the season, which I didn't get an opportunity to do.

Ben: Yeah. I'll think about that while I'm out there.

Zack: How about you?

Jane: I'm kind of the same. Like I'd rather just like get going and like continue going. Like umm, often when Kaitlin is near the trench and like Basil's not there she'd be like get out, have a break, or like, Talia likes to be like come out and have a breeze break, but I just would rather like just keep going until lunch. Like it's just, like maybe step out once or twice to get water, but like, I find breaking and like, just kind of like, I like to just start thinking about things and for me it's just kind of like, get lost in digging and doing your shit, and then time passes.

Zack: Do you get lost digging?

Jane: Yeah! I just, like, I started thinking about something and then I'm... Like it just makes it, like, less of like a, oh when's gonna be my next break? Or like, even like, that's why I'm kind of glad we don't talk or like listen to music, because I feel like that would like frame time more specifically. Whereas like, without any sound it just kind of like comes, time is like insignificant kinda thing.

A49 **Basil:** I didn't have music in our trenches, and I think I initially used the excuse that our proximity to umm Gary's house. Although, of course Gary was only there for the last two weeks. I think that it might slightly annoy me if I need to be focused, I find it a distraction. And it's not like it's just in the background. I think, you know, with Theo and those guys, there's dancing, there's singing along, which I, if I was right next to them I think it would drive me bananas. And it probably drove Lauren slightly bananas. Umm, most projects that I've been on, there hasn't been music. Which, back in the day, you know, you would need batteries and [unclear] and what have you, and umm, so technologically I think it's easier to have music on site now. Umm. No, but I think there's intimations of it being unprofessional. It's like, it's it's a distraction from what you're doing. In fact, I worked, when I worked at Sutton Hoo back in the day, umm, Philip Rahtz, one of the excavators there, had written a textbook on archaeological field practice, infamous, umm very old fashioned, and he, he had a famous section about, umm uhh, during the excavation, the only sound you should hear is trowel on stone. If you had found something important, you quietly get up, walk over to the supervisor, bring them over, show them, you don't [unintelligible yelp], you don't make any [unclear]]. It should be focused and silent. Now I'm not gonna ever go to that extreme. But uhh, I remember, I think, I mean Alfred, I mean Alfred had umm, well I mean, it's you know,

it's like, office environment. Well, no, some office environments do have music on. But umm, umm we had uhh, I think, I mean Alfred had music on in the background. I think he—

Zack: Where? In the rock shelter, you mean?

Basil: Umm, trench [redacted trench ID] and when he was over with Maddie. Umm, he always had music. But it was background music for him, umm I don't know how loud or whatever, I— it doesn't appeal to me. I, I find it a distraction. I can't work here with music. Or if I'm, if I ever have music on it's because I'm writing emails or I'm doing something that I can't be distracted by. Umm, sometimes, you know, I allow myself classical music because it's a foreign language or there's no lyrics for me to be distracted by. Umm I think Alfred was, had a problem with, but maybe he didn't see it as his role to umm make that call, with people being plugged in. So Kaitlin would dig with headphones in. I think a couple other people might do that as well.

Zack: I think Jane did too. Don did.

Basil: Yeah. Umm. And I think Alfred was like, no, you need to be more focused on what you're doing. And it was like, I think like, I didn't feel strongly enough about it, or I felt like the music thing's a bit weird anyway, that I wasn't gonna come down on people. I might think about that for, for next time in terms of...

A50 **Zack:** So I have like one more section. We zoomed through this. I'm wondering about, like, the way you set up, like your research environments, environment or plural. I mean, do you, I've noticed, but maybe you don't, maybe you are less able to recognize certain routines that you get into.

Lauren: Oh, totally, totally.

Zack: Yeah. And I'm sort of wondering if you could explain any of those to me.

Lauren: Umm, I'm a very organized person. I do need that. So for me, umm, packing my backpack the same way every morning, knowing where my things are, sorting stuff out in advance, like taking notes, for myself, in my own notebook, saying tomorrow you need to do this and this and this, and knowing where my notebook is, is very important. So I pack my backpack, either in the evening or in the morning, it doesn't really matter to me. Umm, I know what material or supplies I need, and pack them. I bring them and then when we are on site I always put my backpack in the same place, I take my stuff out in the

same, I mean they're not laid out in order or something, but umm, yeah.

A51 **Zack:** Okay. But with regards to stratigraphy, do you take into account the other trenches and their stratigraphy? **Ben:** Oh, right. Yeah. Because I'm close by to [redacted trench ID] and a lot of the reason for opening the trench I'm in now, [redacted trench ID], uhh was to find similar things as [redacted trench ID], I am following, or I am trying to like compare the stratigraphy.

A52 **Lauren:** Exactly. Because I write it down. But still, I enjoy these interactions with people in my trench. And also people like, we are, like, in a luxury position on the east side, and we are really close with our trenches, especially Theo and I, so we can talk about what's happening in our trenches, correlate it, and ask each other for opinions.

Zack: How have you, like, how would you, like how has that worked out? Can you give an example?

Lauren: Really good. Usually it's like, umm, Theo sticking his out of his trench and is like, Lauren, do you have a moment? Or me saying, Theo, can you have a look at this? And then umm, we compare, usually we compare, like, our stratigraphy or we look at material, like getting each other's opinion on, I don't know, certain flakes, or umm, types of rocks. So yeah, umm, it's really, really interesting. Obviously, Theo has worked here last year so I've relied on his umm...

A53 **Ben:** I have interacted very little with Jolene. I feel that I should interact with her more, because I would like to know like what's going on in my trench. Umm I should probably talk to Agatha as well. Umm, but yeah. I've talked to, I was only here for a few days, well by the time I was supervisor Alfred had already left. So I didn't really ask him about anything. Umm. The only person I've really talked to is Basil, because he's very interested in my stuff, so like he'll come to me and actually give me information, then I will like ask questions.

Zack: What kinds of information does he give you?

Ben: Umm. Uhh just like type of stuff we're finding, uhh...

Zack: From the apotheke, you mean?

Ben: Yeah, just like the type of artefacts that are coming out of my trench, and he'll give me some examples of like, not what to look for, but like some examples of characteristics that are being found on my, or on the artefacts from my trench. Uhh just like hinge fractures on some of the cores and stuff like

that, which are characteristic of–

Zack: How do you make use of that?

Ben: It's, it's easy to like, once you see it, once you see it, right, like if you see a hinge fracture, and like oh okay, that's what a hinge fracture is, and you look at it in the field and you're like, you weren't sure of something, like you weren't sure that it was an artefact, and you see that, you're like oh, that's a hinge fracture, let me take that. So I think it's good to know like that information–

Zack: Because that definitely effects the sieve, like the sieve...

Ben: Sorry?

Zack: That definitely effects the collection of artefacts...

Ben: Oh, 100%. Like it could bias it. But any, any prior knowledge you have is going to bias it, right? Like...

A54 **Zack:** So the third theme, and this is the one I'm a little bit, I wasn't sure how your response would uhh, would play out, but are you involved at all in the preparation of data that will be shared externally or openly as addendums or publications, or like via professional networks or like on platforms like the ADS or whatever?

Theo: No.

Zack: No?

Theo: Nope. I'm not an academic.

Zack: But you do– sorry...

Theo: I don't get involved in that shit.

Zack: But as someone who, umm, works in commercial archaeology, a lot of ADS has a lot of stuff in commercial archaeology.

Theo: Yeah, but it's not me. I'm not a supervisor in commercial archaeology, I don't write up sites, I just dig holes.

Zack: I thought you were do do commercial, I thought you do dig holes for commercial archaeology.

Theo: Yeah, I do, but I don't write anything up.

Zack: So that's the extent of your involvement then?

Theo: Yeah.

Zack: You get the material.

Theo: Yeah.

Zack: Do you, I mean, so I guess you, it sort of seems like you don't want to be, uhh have any sort of involvement with–

Theo: I would. I would if I was asked. I wouldn't mind. I wouldn't be good at it. It's been a long time since I've written anything properly.

A55 **Ben:** Umm, I am not super academic. So that's part of the reason why I'm not like super into the, the–

Zack: The findings?

Ben: No, no not necessarily the findings. Like I find the findings interesting, and like the Levallois stuff, and like the technology, and like the differences and all that. I find that super interesting. But I don't, like the paperwork and all that, like I'm not like, I'm not, I'm not one to like be sitting at a desk just writing all day. Like, I like to be in the trench, I like to be doing something physical and like engaging, right? And I don't, like reading and like articles and like scientific research and stuff, just like, it doesn't interest me, like that much. Even like, I have to be engaged in the topic, you know?

Zack: Yeah, yeah. I feel like you and Theo have a lot in common.

Ben: I think so, yeah. Like Theo describes himself as like I dig holes, and I'm like yeah, I can relate to that, man. Like I dig holes too. Like this stuff is cool, but like, I don't see myself like engaging with it, or like...

A56 **Zack:** Are you familiar with the work of the ADS?

Theo: Yeah.

Zack: Yeah? What do you think about it?

Theo: It's pretty good.

Zack: Yeah.

Theo: I like it, because I can look up sites if I want.

Zack: Do you do that regularly?

Theo: Sometimes. If I'm in, if there's things that I want to read up on. Like, sites I'm working on and stuff from the fields nearby.

Zack: So just out of curiosity.

Theo: Yeah.

Zack: And they have lots of commercial stuff, right?

Theo: Oh yeah.

Zack: What sort of stuff do you look up? Like what do you read?

Theo: It was just, old site reports.

Zack: Like the PDFs, or do you look at the tables, or like if they do photogrammetry, do you look at any of that?

Theo: Ehh it depends. It depends on what there is.

Zack: And it informs you as you work on your own stuff?

Theo: Yeah. It's like, I dunno, I don't use it often. But if you're on a really exciting site and you want to know more about what's happening, then yeah.

Zack: Have you, I mean have you, if you're on the site–

Theo: It's just out of curiosity.

Zack: Are you, but like–

Theo: If you're aware of it, if you're aware of a site that's been excavated, and you've heard that it's supposed to be really good, see if it's on ADS.

A57 **Ben:** Yeah, well I think you always have to be aware of, of who's around and who's watching or whatever, just because, like you've got to be weary of different peoples' personality types. Like if I did something that Lauren didn't like it's different than when I did something Eve didn't like. So like, I feel like I'd get in a lot more trouble, in a sense, if I did something Lauren didn't like and she let me know about it, so I don't wanna be doing that around her.

A58 **Ben:** I sort of questioned why we have to keep the sections, like in our trench, so like uniform. Like we can't pick rocks out. Like if it's sticking out we gotta keep it in there if it's not–

Ben: The section is gonna have a rock sticking into the trench, but they don't want a rock removed from the trench if it's gonna create a hole in the section. So it's just sticking into the trench, and that could be an important lithic, right? So I never understood that, but that's how it's done. Umm, I've also, since moving to Lauren's trench, I've noticed like she wants me to be more like a traditional archaeologist, and like very meticulous. Whereas when I was with Eve it was just like digging away, like not really caring too much about how much we dug, but I think that's more of a personal preference.

Zack: Have you noticed, like have you struggled with that?

Ben: I have a little, because with Eve I could just, as I said, I could just like pull rocks out of the, the ground, but Lauren wants me to dig around the rocks, and then when it comes loose to then do it. And I'm like, well that takes forever. There's no like, we're gonna do ten centimetres every five days, it's gonna suck. But we do have to listen to her, to an extent. When she's not looking I just [mimes the act of pulling a rock].

A59 **Ben:** And I think, like I have in mind when I went in to this new trench. I think part of the reason why we were there is because it was sort of moving

slow, so I moved there with Josh to speed it up. Like, in a sense.

A60 **Ben:** I think my trench reflects my personality in that it's not umm, it's not necessarily done 100% by the book, it's not, it's not like the cleanest, it's not the most, I don't know... I guess uhh, again, I'll repeat the term "by the book". I haven't really been very specific in where I dig or how uhh, how I dig, I guess. Umm I guess it goes with the flow. So like, if there's an area that needs to come down a little bit, then it'll come down. But we just dig where we think needs to be dug, and obviously we're gonna keep with like generally the ten centimetre arbitrary uhh units or whatever, but I'm not very strict in like, oh okay, we're gonna dig this corner of the trench for ten centimetres and then we're gonna move over to this corner of the trench for ten centimetres. I think my personality is relatively easy going, so I think it reflects that in my trench, where it's like, okay, as long as generally the work gets done, and it gets done properly, to a good degree, then we're okay.

A61 **Basil:** And also, so basically there was, there was a couple of people who had more archaeological experience than you know, Don is a commerce student for crying out loud. I took him ahead of a couple of archaeologists because I thought he was a good guy, and he would be a team player, and—

Zack: and he was.

Basil: And he was. Whereas these people were complete pains in the neck, and I didn't want to have to deal with them. And I didn't have to, because it wasn't a field school, I could say sorry, but for reasons that I'm not gonna go into I've taken some other people and not you, sorry. And also, then, I think...

Zack: I think a lot of people were actually wondering what your rationale was for a lot of people.

Basil: Don at the end was asking me sort of straight up about like, so how much thought did you put into people you brought, and where you put them. And it was like a great deal of social engineering.

A62 **Basil:** Umm, and uhh, so I very carefully arranged it in terms of, so I put a lot of thought into who works with who, I also wanted uhh, I probably deliberately put the young men, the young male undergraduates with female supervisors—

Zack: I noticed that.

Basil: Umm, so there quite a lot of deliberate putting stuff in there. So, that, I've not really heard people talking about that so much on other projects. So

that was kind of, there were certain things that I think were very [project] specific that I was thinking about, but other things were like borrowed from other projects, or were like done in diametrical opposition to other projects because I'd seen something that I disliked and I didn't want that to happen on this project. Umm and then there's sort of internal dynamics in terms of like, mistakes you make in year one you rectify in year two.

Zack: Can you give an example?

Basil: Umm, yeah, I think partly, like in year one of the excavation I had some very bright bunnies, who weren't necessarily very nice people.

Zack: Yeah, I've heard about these people, I don't know them but...

Basil: Umm, and it was like, so I think again, some of the people I chose were because they were chipper, and whatever, and you know, they weren't necessarily, if I had based, umm if I had based my application process on who had the best grades and who had the most experience in archaeology you would have gotten a very different bunch of people coming out, and I don't think they would have worked as well. Umm, so when I came to, and this was something I developed, I've not seen this, so I've not experienced this before, umm my applicat— because there were more people who were interested this year I actually had four more applications forms to fill out. There was a couple of people who I quietly told them don't bother doing this, I've already chosen you, so I chose Jane and Kaitlin early on, Maddie shortly after them, and then all the others I got to fill out the application form. Uhh Laurence was gonna came back, Sam was going to come back, but you know, the Dons, the Bens, the Morrises, the Kims, all those guys, they had to fill out an application form, and I think I might have said "have you done any archaeology before?", then all the other questions were basically uhh you know, tell me about your experience roughing it, you know, or outdoorsy work that you've done. Tell me your experience of living communally, and what happened to you? Tell me, give me an example of why you think you're a good team player. Give me an example of where you think you think you did something good or useful. I wanted them, and so that was basically, and I talked to them in the information meetings like, this is what I want from you, I want communicators, I don't want, you know, people, I don't want wingers. I had very good students on paper, who were wingers on the first year, I hated that. If there is a problem, I need you to communicate it. There's a chain of command whereby if you don't feel like you understand this, the power dynamics, umm you may feel uneasy about coming to talk to me,

particularly if I'm the problem. You know, so here are the people who you can talk to. But you know, I want people to communicate as quickly as possible, I want people who are team leaders.

A63 **Basil:** Now there are many times, I mean yesterday was a case in point where it was like, I very carefully selected a student who I thought from class-based experience was very capable, she got A+ in both my classes this year–

Zack: You're referring to Jane?

Basil: Yeah, so I've held onto her, because I trust her to be able to either make her own decisions or be responsible enough to ask other people to help her make decisions for those moments when I'm not there. And yesterday was the first time when I was really dragged off site for any significant amount of time. We had important guests that we wanted to share information with, or extract information from, and I was required to be off site for most of the morning. Which was, I was a bit antsy about that, but I have good personnel on site.

A64 **Zack:** But one thing about Ben is that he is very, you can tell, he just needs a little bit of a push and then becomes super interested. Like Jane, she wants to go to grad school, she wants to do all this. He is on the cusp.

Basil: Yeah. No, I mean Jane was fabulous. Umm I hear there was a bit of jealousy in the fact that she was treated differently.

Zack: Well I think also, I had a group interview with them, Jane and Ben, and I think that influenced them in their attitude, which I think they deserve to be a little higher, but I was concerned that I... So after that I sort of toned down my talk with them, and I sort of tried to...

Basil: But it's like, it's like you know what, it's like I'm not interested in, you've all got this great opportunity, certain people are going to be given more responsibility than others. I will try as best I can to give everybody a chance...

Zack: But certain people are more, can handle it more than others, and that's fine.

Basil: And you know, Jane and Kaitlin, I picked them from the get go, and Jane ran with it, and was very professional, very organized, completely trustworthy. I basically, you know, didn't move her around, because it's like if I need to go off for a meeting, I can trust you to carry on, and you're competent in what you're doing. Umm, but...

A65 **Zack:** So you mentioned how it's a bit of a unique, like museum slash research

role, I'm wondering if you could elaborate that, on that, or maybe mention or raise any ways in which [this project] presented you with any unique experiences that you woudln't otherwise have in other research environments.

Jolene: umm museum role is in a way where you process material in a very standardized manner, so you do very technical stuff that anybody can learn after a while. But do know how to do these things you really need to have some broader knowledge of the specific period in the region, which involves doing research, basically, and the comparisons of the finds, again, is made by research and interpretation, and the end, you know depends on that a lot. So umm I think it's unique in a way but the most of the specialists on other projects archaeological projects do similar stuff too, so you know it's unique in a way where you work, you work on a project, you don't work for the specific institution, sooo you know. But I don't see it as really really unique haha

Zack: It's very, it's generalizable across archaeological projects.

Jolene: Yes.

Zack: And do you have anything to say on that, or?

Agatha: No, I mean I agree. There's nothing new that I have learned in like logistical, logistically new. Like everything that I learned new is completely connected with methodology of processing those finds of a specific site, and I never been separating so much non-cultural from cultural

Jolene: I mean okay, you always adopt a methodology to a specific site, you can't just take it and you know, bam

Zack: yeah

Agatha: That that's why I'm saying that there is nothing to connect it, I mean like nothing new about the specific museum position here.

Zack: Yeah, yeah I noticed also it's a very mechanical process, in the museum and it seems like you just schematize it

Jolene: Especially especially during the escavation season

Zack: Yeah

Jolene: A bit later it becomes more of a research because we discuss stuff. For example we when we had a short study seasons, Basil and I work in a lab, we had uhh you know of course a processing phase but then you know after that we do a little bit of researching in the afternoon and then discuss stuff

A66 At the dig house with Dorothy, who arrived last week to do archaeobotany work. We just had a really interesting discussion about her views on archaeological

science and her role as a specialist that I will jot down here in as much detail as I can remember.

We started by talking about the tedium of her work here, which essentially entails looking through a microscope to identify seeds and other botanical remains. Stelida does not have good preservation, so her work here is relatively unexciting.

She mentioned that a big part of her work comprises looking up reference examples and drawing comparisons between what she sees and what has already been established by others. I suggested that perhaps this might be comparable to lithics analysis, and she politely agreed but noted that in archaeobotany there is much more variety. I think this was in reference to the use of reference collections ([illegible] polite, if reluctant, agreement) rather than the experience-based learning ability that I was thinking about.

I then tried to clarify what I meant or segue the conversation to that topic that interests me, by asking how she learns or gains familiarity with the reference collections, and thus gains enhanced ability to recognize the botany of the past, and she stated simply that it's just by looking at them (paraphrased), or just a build up of experience.

She noted, however, that there is some regional specialization as well, and that one must become familiar with the diverse ecologies of certain broader regions. She noted the case of Turkey specifically, as a place with an incredible amount of ecological diversity that has still yet to be fully documented.

She then told me about how these reference collections are made, specifically that they are from botanical surveys conducted since the 1960s, which are done by modern botanists, i.e. those botanists who are not necessarily concerned with ancient plants.

She noted, however, that certain plants get more attention than others because of their attention paid by humans in the past. For instance, grain has gone through more change than weeds so archaeologists select resources dealing with grains and see them more heavily.

Her region of specialism is Turkey, Greece and Syria.

We then talked about the need to bJackce the science with the need to interpret one's observations and contextualize it in relation to the archaeology, i.e. to situate it in relation to evidence of past human activity and make it informative in this sense.

She mentioned how 'old school' archaeobotanists are very willing to stop at de-

scription of the botany without contextualizing it in relation to the archaeology of the site that the seeds were obtained from.

We then talked about Catalhoyuk and the integration of specialists and diggers. She has worked there so she has first hand experience with how things are done there. She said that she supposes that the more information you have while digging the better your interpretation can be - paraphrased, though I did note the specific use of the word 'better' as a generalized value statement, tacitly applied. I don't think that she has much experience digging, but I would like to compare these remarks with those of Theo, with whom she is very close friends. She noted that Catalhoyuk is interesting because it has lab space in the dig house - while there are things that you can't do there, it is exceptional in terms of the capabilities for specialized work to get done in the field, a stone's throw away from the site.

We discussed how this integration of field work and lab work is becoming much more integrated, however she remained somewhat skeptical about how reflexivity and other post-processual ideals were actually being enacted.

I suggested that perhaps that it is somewhat of the norm now to integrate specialists into field work, that it feels less impactful.

She notes that it is still somewhat common, though less so than in the past, for samples to be "sent to us" at [redacted].

She told me about the divisions between the archaeologists and the archaeological scientists at [redacted]. They are in the same department but occupy two separate buildings. Her unit, the archaeobotanists, work in both, and she sees herself and her work as straddling this division.

Archaeobotany, it seems, is about situating botany in relation to past human experiences. She humanizes the seeds, or rather, makes them relevant to human history or experiences.

She compares this work in a somewhat more ranty manner, with chemists of geoarchaeologists, in the archaeological sciences building, who work as if the things they look are modern. They also do not make their findings as accessible as they could be, according to Dorothy. The division and lack of communication among the two camps she describes seems to result in some animosity or value judgements concerning the informativeness of each others' work. She appreciates the strong foundations of science, but also recognizes the need for it to be in service of broader ends, such as archaeological research questions.

She notes that many of the scientists are actually trained as chemists, geologists

or climatologists and themselves do not understand why they are employed by the archaeology department.

We then veered back to Cataloyuk somehow, and I expressed my views on the lack of consideration of science studies, which might help to ground a lot of post-processual studies.

We then reiterated some of the same thoughts, discussed the mis-use of Latour by Hodder, it was mainly me doing the talking on this though.

We were eating and preparing lunch throughout this. I'm letting her choose a pseudonym, and she mentioned Garrod (I forgot her first name), who excavated at Jericho in the 1930s.

A67 Jolene: Yeah, I would say the biggest challenge is for us to explain when somebody comes, they're suddenly in a lithics lab with these amount of lithics that they don't understand, really. You know, but we help to explain the lithics to somebody okay, you explain what's the platform, what's the bulb, parts of the [unclear] but how can you explain you know what you're really doing, and what's the significance and how you turn it into a story after that? So I think I've been struggling the most to form the story for the people who don't know what they're dealing with, and especially for the students who are interested. That's the funniest, they say they're interested but they don't know anything. So you know you need to prepare yourself and I always thought okay if you're interested you should be prepared, you need to read a lot, if you're really interested, and not just to say that. But even with just that you need to deal with it so you just need to take off a story for them to tell them so they can remember. Very basic, very easy things to remember, very striking stuff that's very very shallow aspect of what we do there, it could be misunderstood if you use too literally, you know, what we say to them, it could be dangerous. But then if they're really interested, they won't stay on just that.

Zack: Do you have any examples of such situation?

Jolene: Well when I was explaining what sort of stuff people made in the Middle Palaeolithic, in the Upper Palaeolithic, in the Mesolithic, in the Lower Palaeolothic, so I simplified so much that it sounds like it's easy, but you know you have overlapping, and you need to know more than just two sentences about how people make stuff in the different periods. There's much, much more. And if you just take it literally as I said, you know, it could end up just spreading misinformation. I'm sort of spreading misonformation but I always count on]

Agatha: You're spreading the interpretation

Jolene: I'm always counting on people while I explain the basics and say if you're really interested you know I can give you some articles, get some articles, if something's not pretty clear from the articles I can help you, answer any questions...

Zack: Do you have go to explanatory peices that you always point to?

Agatha: Aurenche, show and tell crate, like whatever is on the table

Jolene: I just have one, show and tell crate, yes I mean I have a bunch of articles on my computer that I like to...

Zack: But are there any that you select for, that you show people who are interested more often?

Agatha: There are a couple of textbooks, one we have at the lab it's pretty [unclear] because of the drawings

A68 Jolene separating diagnostics from non-diagnostics. Non-diagnostics get pulled aside to Agatha's side of the table, where she separates those into eco-facts/natural/too weathered to matter. She throws those in a zimble, and counts them off. This is counted, and subtracted from the number recorded the other day, in error, which included both natural and cultural together.

A69 **Jolene:** Yeah because you can't study dirty lithics

Agatha: I mean that's also connected with the schedule, we changed the schedule of the new place we worked and we are supposed to stay there until five

Zack: What do you mean by the dirty lithics?

Agatha: Well the lithics came dirty again

Jolene: They're not washing them properly, so how can you make something

Zack: Do they get better as time goes on?

Agatha: Yeah, but I mean the thing is like no one is thorough enough to empty the bag from the soil, and then put the washed lithics inside, and no one is there to actually control the, because we have a new schedule so I mean we put some people in charge but...

Zack: Pardon my sort of half-feigned ignorance for the sake of the interview, what does dirty lithics, what are the problems that they cause?

Jolene: Well you can't study them

Agatha: You can't see anything

Jolene: They bring them to the lab and you're supposed to look at them as say this is you know, i dunno

Agatha: Sometimes even when they're washed properly and the raw material is a bit like, we're not used to that raw material, it's hard to see the ridges and everything, but like even if they're not washed properly then that's another headache.

Jolene: It stops us from doing our, so we need to do their work

Agatha: The worst was like talking with Denise and trying to pursue like what is re-touched and what's not, and Jolene was like pushing one small piece saying like this is retouched, and they were like no it's not, and then I just went and wash it and there was a completely fresh, it was white haha and it was retouched I think, it sucks.

Zack: But did she think it was retouched?

Jolene: Yeah

Agatha: Yeah

A70 **Zack:** And umm I was hoping you could tell me what infor– what your goals are for this umm interim, or this week, reading week season, or umm experience, and what new information is prompting this?

Basil: Umm, to an extent umm, we schedule these, sort of a, fall and winter mini study seasons largely because of like, because I get a break. I can go over there. So I was, you know, irrespective of what new data we would have had we would, you know, we would be going there next week anyway.

A71 **Basil:** And that, again, is another sort of interpretive benefit of working with a small group in October and in February, because rather than having Michelle and a sidekick measuring X, Tiffany shuffling rocks over there, it's like, there's just two or three of us working on one thing at a time, all the space we need, we can use. And there's huge intellectual knock-ons for that, positively. You know, the ability to see everything in one go, and to approach it in terms of like, you know, I've just got Alfred to send me the latest Harris matrix, with the dates attached, for trench [redacted trench ID], so we know that these four units, we can lay out together, they are the same thing, you know. And all these three, these four units are all the uppermost part of lithostratigraphic 2, or whatever.

A72 **Basil:** So, you know, I'm psyched. I can't wait to get there. Partly because like I'm sick to death of the weather here and teaching is driving me nuts. And it's, you know, basically, from eight o'clock until three, and if we're lucky until five o'clock in the afternoon, that's all we have to do. No internet, no distractions.

It's a purity of work. I'm not managing undergraduates, I'm not creating rotors for cleaning, I'm not deciding what we're digging the next day, we're just doing that.

A73 Zack: So my first question is, do you see fieldwork as being somewhat distinct? How do you separate the different research environments you work in? Like field work, and then lab work, and then other work? How to they relate to the overall professional...

Basil: Umm, I would like it to be as integrated as possible. Obviously there is the real pragmatic, the field is here, the labs are there. I'm not so used to talking about uhh, Pinnacle Point, in South Africa, where they actually have an OSL lab on site, they're doing this stuff on site. You know, I'm not, I don't think about that in terms of like ooh, that would be lovely, but what I do desire, and this is where it becomes a bit difficult and where some frustrations for me come in, is like, I want the people who are going to be doing the lab work to be as engaged in possible in the field. So that's why it makes me very happy that we have someone like Marie, who is going to be doing our OSL dating over in [her lab at her home institution], coming to the site, doing the sampling, discussing in detail the archaeology with knowledgeable characters such as Gabe, Alfred, Liane, because it makes me feel so much more confident that the results we're gonna get are trustworthy. Now, if push came to shove, I'm sure that Alfred, Gabe, Liane will be able to take those samples to the standards required by Marie, send them to the lab, and Marie would be able to process them. Indeed, that's exactly what we did with out first, umm, set of OSL dates. We took the samples, and we sent them off to Clifford, who until last year, umm I'd never met. Umm, and and, you know, that kind of umm lab based work is fairly standard for archaeology. You take a sample, you send it off to do something, but as much as possible, I want those people involved to be at the site so they understand the questions we're asking, they really understand the archaeology, and that will help them umm fine tune their sampling, their comprehension of what they're engaging with, so it's very important for me to have, you know, in theory Melinda from [redacted] is doing the archaeobotany, but she's given us her PhD student, Dorothy. Well Dorothy is there, she's seen the archaeology, she's working with us, you know, so there's a greater degree of comprehension. I really wanted a woman called umm Rachel this year to come down and look at our, our charcoal material, and in the end she couldn't

umm come, uhh I saw her in [redacted], we're gonna try to move the material to umm the [redacted] Lab in [redacted] for her to work on. And for me that's a bit of a disappointment. You know, it was always going to happen sooner or later, there was gonna be somebody who couldn't come, or who didn't see it as necessary as actually coming, we'll look at this material, in a completely isolated manner, you know. And I'm sure Rachel has done fabulous work on carbon from Palaeolithic and Mesolithic sites elsewhere in the [region], she is exactly the person to work with, but I find it a bit sad maybe there will be a slightly lesser impact, because you know, she's never even been to the site. Yes, we can give her text, we can give her photos, we can give her videos, but it's, for me, umm there there's that kind of real, you know, the reality, the actual being there. I, I, I feel, I believe, I would like to think, umm, it gives the scholar an extra...

Zack: I mean, can you be a bit more specific though, when you think about that being there, like, what that really entails, like how that really is truly beneficial?

Basil: Well, I think, you know, it, it was great pleasure to you know, sit back across the table and watch, listen to Marie and Gabe and Alfred really talking in great detail about what they thought was going on in the site formation processes, what implications that had for sampling, what implications it had for the interpretative limitations of what they can say, and how things could be bracketed, how things could be rescued. They were already working on the narrative, they were like, it was basically, they were ready to roll with whatever we got. You know, it wasn't a matter of like "this is the result, ooh now what might this mean?", they were like really thinking through what this sort or, where this might actually take us, and they were all, they were using the same language, they really, there was a great deal of mutual comprehension. Umm, now, you know, in terms of the site, if we sent the stuff off to umm Marie, she would have generated the same dates, but there there would be, you know, I, with with Clifford and and the University of [redacted] there's been a bazillion emails, I mean part of this is pragmatic, in terms of like a bazillion emails back and forth, and not quite comprehension, you know "oh sorry, I didn't realize that this sample came from this", like you know. Umm, so. And I think also, maybe part of this is like, you know, Marie is now invested, she's part of the team, she's part of the community, hopefully she'll have a feeling of, you know when push comes to shove maybe she'll just take it a bit further, because she's,

she has an investment with it. Whereas like Rachel, eh, this is the latest dataset to pass across her desk, yes, you know I've got an obligation, but maybe it's more of an obligation rather than an investment. You know, so it's, it's, it's being part of a community of scholars by actually coming and joining us. So you know, we have a personal relationship, Rachel and me, but Rachel hasn't met and talked with Dorothy, Dorothy has separated the samples for Rachel, Dorothy umm, Rachel, if she does the work in the [redacted] Lab will be able to engage with Alfred who will be there at the same time, so there is a bit of a disconnect. So it's not a complete disaster, but I feel, you know, part of this is wanting to be invested in the project.

A74 We have received dates back from Marie, who sampled the trenches last season, and they are much younger than we expected. The hearth material is now thought to date to the Neolithic, and the furthest date is around 40,000 years, if I recall correctly. This prompted Basil to finally take a look at the pottery fragments, particularly those recovered from trench [redacted trench ID] near the rock shelter, and they perfectly correspond with what would typically be expected for the Early Bronze Age.

This was announced to the team on Sunday night at dinner, as we were about to start the final week of the season. People seemed quite confused, but resolved. The science has spoken. I think that Basil and a few others had known for a while, since Lydia asked me on Friday (or Saturday maybe?) if I might search for contexts with pottery in them. Moreover, a very clear chart had been produced, by Alfred I think, that relates the lithostratigraphic units to each other, and to the dates.

A75 Now, the dates, now that Marie has given us the dates, that's a huge change from what we're doing. Previously, Jolene and I were tentatively, with great trepidation, going through this stuff in terms of, where we think this looks like Mesolithic, based on what's published from other sites, umm we think it's Mesolithic, it's kind of high up in the sequence so maybe that makes sense that it's the latest material, but there wasn't a great deal or surety in this. Now, we're going to be able to pull out bags from lithostratigraphic unit 2, and we have a bracketed date, and it's like, okay Jolene, now let's look at it, you know, pull out the stuff that you once upon a time would have called Mesolithic, or is there anything that we would have once upon a time called Mesolithic, because now we know it's not, it can't be. The knock-on effects of this might be horrible.

In terms of like, our Mesolithic might actually disappear. But it's gonna give us a great deal, you know, because, you know, because the site was new, because the site was different, it was really difficult going forward. You know, there was no sort of, we felt very, you know, we were happy the stuff was cultural, but beyond that it was like, what are we dealing with? In terms of like the activities, the dates, it was like, you know, it wasn't a very pleasant feeling, it was just like terror. Now we feel like we have something solid we can work with, in terms of like, the dates of this stuff, you know, we might still have a whole bunch of residual stuff that's been dragged down the hill during erosion, but it, you know, it has to between this date and this date, in terms of like the latest possible date. So I think that's gonna, I think, I'm really excited about getting there and looking at it, in terms of, we now kind of know what we're looking at. So the aim is to try and go through an entire sequence of material to create a recording and interpretive framework that then becomes, like, the way we approach all the other datasets.

A76 **Basil:** Where we had a major discrepancy and a bit of a hiccup was with regards to the aeolianite. So, once upon a time, Takis had spotted the aeolianite, said this is a perfect place to look for embedded tools, dates, etc. And then there was a bit of a re-invention of the wheel, which slightly annoyed him, because then Dan and Katie ran with it, thought they could see four different layers within the aeolianite, representing different periods of formation. The dates were then screwy between them in terms of like they weren't in sequence. And, you know, we started disappearing up our own asses in terms of trying to figure out why on earth hat would be, and then Takis came back, looked at the dates and said, I do wish you guys involved throughout this process, because if you remember, which you obviously don't, when I was here I told you it was a singular block of aeoliante, and your stratigraphy is a false stratigraphy, they are not different layers, they are different umm erosion and degradation of this. If you, and lo and behold, if we looked at the dates from the unweathered areas they were all the oldest. So umm, that was a lesson learned, in terms of–

Zack: –I remember that conversation, yeah

Basil: Yeah, well we really have to be sort of, that was a bit a humble pie being eaten by us. So we've certainly learned that, you know, the integration is really key in all of this, which is why, you know, I'm sure we would be capable, or Justin, Dan and Katie would be capable of taking samples, OSL samples to

send over to Christelle, but why I've always been really keen for her to come to site, and get really involved in really understanding what she's working with.

A77 **Zack:** Is Jolene involved in any way with the preparation of data? I mean, she's been involved in the production of the data, but in the preparation of it for, kind of, publication? I'm just thinking about the long term uhh scope of the project, and how this is, you know, these, umm, hits the end, you know?

Basil: I mean, she's, you know, the boiling down of artefacts into a series of numbers, umm she doesn't play with those. Or, I mean, she's quite welcome to, she's not had the time or shown the interest thus far umm for that. However, she's very much in control of data in terms of visual representations, the technical drawings of artefacts. She has the originals of those. We now have scans of all of those, so we have copies. Umm but, you know, it's her that makes decisions in terms of which artefact should be displayed with which ones, you know. She has the logic and the vision uhh to then manipulate and uhh and interrogate those data. So she makes the page sets. You know–

Zack: What was done with uhh, was it Richard? I thought she was really involved with that.

Basil: Yeah, I mean she's working with me, with Richard's stuff. So, you know, so she has a, you know, that's a significant intellectual input. You know, it's not just the technical aspect, but you know, so you, a) there's a choice in what should be drawn, which is based on uhh influences of, you know, the, you know, the knowledge that this item is a good representative of x, and x is what we are trying to uhh deliver to the audience. Umm and then for her to decide that like these five pieces, there is an underlying logic that they should be together and in this particular umm structure. And some of that might be, like oh, some of it might be aesthetic, some of it might be like I can't have this on this line because it's too big so I'll move it. But, you know, she makes all those decisions.

A78 **Zack:** Yeah. So umm, what would you say is the overall objective of your work, and how does it contribute to [the project]?

Jamie: I think the overall objective is to get the data to where it's useful to people. So either useful for them to like input their information, or to retrieve their information to do like research and answer their questions.

Zack: And what motivates you in this work?

Jamie: I really like the idea of, like, I like compiling data to answer like hard questions, I like the process of cleaning it up and figuring out what we can know

and what we can't know, and how we can make reasonable assumptions, and how we can make our data work for us.

A79 **Zack:** So can you briefly reiterate the main purpose of the trench [redacted trench ID] publication and outline its contents?

Basil: Umm, the reason for publishing that as a standalone piece is partly pragmatic, in terms of this was the first trench to be excavated with a very deep sequence and for all of our to have come back, and it's given us thus far our oldest chronology. Umm so, we started with the survey, in theory we should have published the survey first, but I think I felt, and others felt, that people could still turn around and say we don't believe your material because it's all surface material. So the idea is if we publish and people believe our trench [redacted trench ID] material, then lots of other things can be hung off it. So it's gonna be this really fundamental sequence, to really prove what we have, and then use that to reference in a bunch of other things. But also it was come up partly sort of a an experiment in how do we work with the data, and manage it, and move ahead for publication. So to an extent it's also become a standard of how we then approach other deposits, either within a single sondage or between them.

A80 **Jamie:** I'd like to spin off from that in some kind of visualization so that people can easily kind of see the data on a bigger scale, so like how many of X raw materials do we have from X period, something like that. So some kind of visualization, graphing, something. Maybe working with the GIS stuff, umm. Like I want to start asking questions of the data, once we have them compiled, and see what we know.

A81 **Zack:** What kinds of outputs are produced through your work?

Jamie: Umm, well ideally, like I was planning on making some different graphs and stuff to, very preliminary, kind of like analyze and look at, see trends in our data. Outputs, I guess, are different to web interfaces for field people to interact with and input their data. Umm, yeah, that's pretty much it.

Zack: Okay. So they have a purpose, then.

Jamie: Yes.

Zack: So for, for, helping people do their work, or for your own...

Jamie: Yeah, I think, the, yeah the web interfaces are to help other people but to ultimately the overall goal is, I guess is to make use of our data, do something

with it, see what it means.

A82 **Zack:** Hmm interesting. How have you come to adjust to this new, this different kind of setting that you say is kind of different than normal? Like have you, I mean obviously you have different staff, different expertise coming in, but how have you prepared in other ways?

Basil: I think having worked here for a couple of years on the survey, and thought about the nature of the archaeology, we sort of were prepared for the fact that we probably weren't going to need a full time pottery specialist. You know, even if one excavates, you know, if one targets a site of a particular period, often one ends up dealing with later or earlier periods whereby a member of your staff might be somebody who has a skillset that's not necessarily essential to your own research. You know, we have a bit of Byzantine overburden, we need a Byzantinist, I'm not actually interested terribly in the Byzantine period, that sort of thing. Umm here it's sort of, you know, it's largely born out of my suspicions that, you know, we didn't really need a full time pottery specialist because the survey produced very little–

Zack: Yeah Lydia just asked me about the pottery, it's 18 contexts.

Basil: Well, that's very, I mean that suddenly became a concern today for various reasons. Umm, conversely, you know, having gone from survey to excavation it's like right, I need an archaeobotanist, I need a palaeozoologist. Umm archaeobotany has certainly played a role, and we have Dorothy here, who is lined up from the get-go, or rather her, her umm director of studies Melinda was the one who I got from the get-go. And I lined up from the get-go, when we called [redacted] from umm [redacted], who is meant to be looking at our bones, but we don't actually have any yet. So that was, you know, if I'd been more geologically savvy I probably would have appreciated that the underlying bedrock, the chert, etc would produce very alkaline soil and by extent would probably produce very little in the way of organics and bones. But certainly, umm, you know, in terms of team composition there haven't been any huge surprises. I mean we're bringing in umm obviously Gabe I've known for a very long, I've known Gabe since about 2000, 2001, and his skills, and he's published with me on a number of other projects.

A83 **Basil:** And I lined up from the get-go, when we called Roseanne from umm [redacted], who is meant to be looking at our bones, but we don't actually have any yet. So that was, you know, if I'd been more geologically savvy I

probably would have appreciated that the underlying bedrock, the chert, etc would produce very alkaline soil and by extent would probably produce very little in the way of organics and bones.

A84 **Zack:** How does your work fit in alongside other practices or workflows, such as, like, materials collection, finds analysis, data analysis, etc?

Jamie: I think that on the, like the data collecting and processing side, it's very much, we, we do what the uhh, the field people need, like we work with what they give us. We do what they need us to do. And as we're doing that, I think, I mean I personally always try to keep in mind how we're going to be analyzing this data after, because that's what I really enjoy doing. So as I'm getting the data that we're given by them I'm thinking, how can I format this and store this in a way that will be useful to me later when I want it?

Zack: Yeah

Jamie: But, like, ultimately the main concern is, you know, what they give us, what they need from us.

A85 **Zack:** I noticed one example I found really fascinating was your conversation, your three way conversation with you, Alfred and Andreas, I found that really fascinating as you all seemed to have a different role in the conversation. I was wondering if you have any strategies that you commonly use, to assess whether they're different, or whether they're integrating or whether they're divergent, or like, how do you sort of assemble these different ideas, and these different knowledge bases?

Basil: I mean, either I initiate meetings or I make sure that, you know, the three people who need to be talking to each other are brought together. I mean what was fantastic last year was having brought in Marie, Marie, Gabe and Alfred spoke the same language, it was wonderful to see. Whereby I was like, after a while, okay, I'm going to go off and talk to these people over here, you guys are obviously perfectly capable on your own.

A86 **Zack:** Umm, do you thing that this translates necessarily into publications, or like, like presentations of this work, and other content?

Basil: Yeah, I think that, you know, I mean, for me, I was delighted to have umm, you know, when Marie came to visit, it was going to be done as kind of like a collaboration as opposed to I'm just gonna be, you know, but there was still going to be a payment involved, you know. So it wasn't exactly like, you

know, we send stuff to Clifford in [redacted], he does the analysis and sends us the bill. There was still going to be a bill to be paid with Marie, but she was going to be involved, she was going to come to the site, the idea was to hopefully umm, maybe get an MA student, MSc student in [her university] to be dedicated to this, and again, what I wanted was the dedication of an investment, because then I think you get better quality stuff out of it. But then I was delighted that she then, you know, she doubled down in that she said, no, I want this to be a collaboration, umm this is the kind of project I need to take me up to the professor level, you know I need another string to my bow. Umm, and so she's, she's now intellectually and personally invested in us. So for me that, that's a good thing. I think it's, a knock-on effect is, you know, it's going to be better quality science, better, you know, because she's gonna care. Umm, now, so you know, a lot of what I'm trying to do is, so part of my directorial, going back to issues of umm team construction, is trying to find out, from conversations with other team members, and usually the Alfreds and Dans of this world, is like, okay, so if we want to find out something about the environment, can this be done, how can we do it, what techniques, who's out there, and then I want to try, my, my immediate reaction is I want to bring that person here. I want them to visit the site, I want them again to have a comprehension of it, umm from their perspective, because you know, I think if they see it from their eyes they will understand much more clearly what we're doing. Umm, and then you know, [unclear] we can send samples to them or they can send us a student afterwards.

A87 Basil: We're still, I always sort of gave, because Jolene's been here from the get-go she has sort of first dibs on what sort of material she wants to work on, and I think she was always keen to work on sort of Middle to Lower, but until this year we didn't really have much of that. Now that's crystallizing a bit more for her, whereby it makes sense for me to bring in somebody else to work with me on the Upper Palaeolithic or Mesolithic.

A88 Basil: Umm you know, there are other people who we might bring in after the event to work on other soil science or other aspects of the raw materials, and I'm certainly sniffing around for at least one more junior scholar to sort of, you know, take on some of the lithic material for publication.

A89 Zack: So, moving on maybe to some more uhh, the aspect of data sharing in

general, umm how involved were you in the uhh preparation of data that will be shared openly? I mean, obviously it's still in uhh processed, you said that you would have that contact us for uhh... Like, who is it, is it Gabe or, like who is going to be doing that, and how do you anticipate that being, that going on?

Basil: Well the umm, the, there's two main, umm three main sets of data in this. There's the geoarchaeological data, umm which, hopefully we have made accessible. Everything that the public or the readership needs. Umm, there is a slight tempering of all of this in that these data underpin a yet to be completed PhD by Alfred.

Zack: Right.

Basil: Umm. The analysis of the lithics, which is undertaken a level 1 and a level 2, is primarily uhh, if not exclusively undertaken by Jolene and myself. Those data are then fed into a database, which means by extent you and others have immediate access to it. Gabe often then runs with those numbers and does a lot of, sort of, you know, what can we tease out of this patterning-wise, you know. Usually it's a matter of, like, Jolene and I are very much focused on the description of the assemblage, and we generate these data that somebody like Gabe can then sort of interrogate in terms of assemblage structure and correlations, and whatever umm.

Zack: How does that relate to the geoarchaeological? Does it link up in any way?

Basil: Umm, no. Hahaha. So, you know, again, it's, I'm painfully aware of the nature of Alfred's work, in that he's a young scholar who needs a bit more control over his data than somebody like myself. Umm, so, you know, he sent, you know, Alfred's been very good in terms of, he's always been on time or up front in terms sharing data, interpretations, be that photo micrographs, be that maps, be that text, be that quantification, qualification of whatever it is he's doing. Umm, but in terms of the original counts, or all of the various versions of the photo micrographs that he took before he chose version seven, those I don't have to access to, and nor have I asked him to hand it over yet. Umm, because I feel, you know, his rights, in that instance, kind of trump that of the project.

Basil: Umm, so umm, the number crunching that go, you know, the, a whole bunch of the smoke and mirrors that underpins umm the French dating people, you know, we have all the end products, but, you know, the algorithms, the 17 excel files that have been played around with, or whatever it is they do in

France, I don't have those. And to be honest, my mind doesn't even work in that fashion, in terms of I need the archive, I need to be able to see every stage in it. Because if they gave it to me it's gonna cluster up my computer and I wouldn't know what to do with it in the first place.

Zack: But what has the publication done with it?

Basil: Umm, like I said, Science Advances requires that we make available, make data available, umm primary data available or make, have a commitment to sharing it should somebody ask for it.

A90 **Basil:** I slightly re— you know, I uhh, and this is where I umm, I am jealous of those projects where, like you know, when you talk about [redacted]'s lab, or [redacted]'s lab, people come back and there's like, still energy, in the house, you know, [redacted] has a bunch of people at [his university], who he's probably working with up at [his project]. He doesn't leave [his site] in [the field], he carries on having these conversations, he has people working on PhDs on that material each week. Yes, he might get bogged down with the teaching—

Zack: What do you think is the difference there, between these two research envir— or attitudes?

Basil: I mean, I think, you know, it's, I just haven't, somebody like [redacted] enjoys that relationship, I, you know, I feel a slight exasperation that I still don't have good quality PhD students, or graduate students applying to work with me to work on [my project] or related activities. You're doing stuff at [your university], Alfred's doing stuff at [his university], that's phenomenal. Umm maybe it's a matter of like once we've got a couple of high profile publications out people will take notice of us and then people will start coming. Because it would be great to come back, I mean I will have that with Sam. Umm he's going to be pushing me, because aspects of mainly the survey [case] rather than the excavation, is going to be fundamental to his MSc. So hopefully I'm going to be having more regular discussions with him, which is gonna re-engage me with what we're doing and push me further.

Zack: My thinking was that, maybe because of the very decentralized nature of the work, like everyone is international, scattered all over the globe... so it's a very, like it's hard to assemble people, except I find it very different energy on the site, I mean when you're there. Just a cohesiveness that comes together, do you think some of that is lost?

Basil: I think to an extent that's the nature of the beast. I mean, even some-

where like Catalhoyuk, you know, I think, I mean I think some people are quite happy with the idea of like being able to do their intellectual work on the archaeology in the summer in the field, and then they go back to their university and their university will takes over their lives, anytime they get to write about or think about their project is a bonus. And you usually try to create, I think a lot of people then use things like conference presentations as umm one of these, kind of like, you create the stick to poke yourself with like, okay, this is going to force me to think about and engage with what we just did the last summer, umm, in between the two seasons. It's very easy to just let your archaeology there, in the summer. But if like, I'm able to like, if I commit, to giving an AIA talk, that's going to force me to think about these things and whatever, or if I were to go and give a talk at [redacted university], somebody's invited me, those things will push, you know, create energy.

A91 **Basil:** And then I think I've been slightly disappointed in terms of, I was kind of expecting a lot more contact from students and the like in terms of like, oh, can I come and work on your project now? And that's really not panned out. I had one student from Oxford who at the last second was like, oh, I'm going to be applying for my PhD in two weeks time. I've read about your stuff, it sounds really interesting. Can I do my PhD on your project and have you got something for me to do? Ha. Which was not really what I was looking for. So, you know, in terms of like more undergraduates or graduates crawling out the woodwork on the basis of now knowing more about us, because I think, I I'd always kind of said that I was a bit surprised we didn't have more people sort of contacting us to work with us. And it was like, oh, you know, maybe because we didn't put anything big out publication wise. Well, now we have. And again, maybe I'm expecting too much too quickly. But, you know, it's not really percolated through yet.

A92 **Basil:** but you know, if you're part of the team, then you know, one of the things I want to do is encourage people within the team to come up with new projects, and like, do you want, you know, that was the whole ethos at [prior research project]. It was like, you know, young people would get together and sort of like "hey, I'm interested in this, you're doing that,

Zack: So they're communicating, yeah

Basil: let's do something collaborative. Yeah, and and new questions... So I, I create a framework, I come up with certain research questions, but then

other questions to come out, uhh organically, and I think by far the best way of doing that is by having a community together. To talk, that's why it's also so important that I want people to umm have the meals together, to talk to each other, to you know, create spaces for more things to naturally, you I'm looking forward to the moment when somebody turns around and goes "hey, we're interested in doing this, is this fine? We'd like to give a talk at this conference". It's yet to really happen. Umm, and again I think some of this is about investment. Alfred is really invested at this point.

Zack: I think Alfred and uhh Tiffany were sort of getting into that.

Basil: Yes.

A93 **Basil:** and also the other thing is that we don't, we're very lucky in that we have a number of people here for the entire six weeks, but when you're dealing with specialists, specialists as for many years I continue to play this role, were involved in many other projects. So people come in for two weeks, or a week, or three weeks, what have you, and so sometimes you get a, you know, one of the things I've noticed this year, is like a paranoia about person X is here before person Y, and person Y is worried about person X, they don't know them, they don't know exactly what they're doing, they don't quite know how that interacts with them, is this a threat, and so, you know, there's a bit of, sort of, you know, calming of people down, and clarifying, and occasionally saying that's very interesting, but actually so and so is working on this, talk to them about this, don't replicate it. And part of that is like, you know, it's respect for scholars, and usually, like I said, this is a junior scholar thing.

A94 **Basil:** Umm, Ana used to be much more central to what we were doing, but you know, you can see people who are invested and then people who can make time for you. Ana has made time for us over the last couple of years. There's been less, you know. [Our project] is not central to her universe. Now this year I think it's part due to pragmatics, she had to finish up a bunch of stuff for her postdoc. That's what—

Zack: When she was there I noticed it was less of a...

Basil: Yeah, you know. Which is difficult. If you turn up that late, you turn up for a week, it's going to be socially a bit clunky, she won't know so many people, and this year she came, she didn't overlap with a bunch of key people who she knew so well. Umm, so that makes things difficult. And she's, you know, been talking about trench SF wherever, I was like where the hell is that?

There's gonna be, there's gonna be a disconnect. I was very happy with what Ana did this year, I was very happy.

Zack: I was in the apothiki for three days that week, snappy, always on it.

Basil: She, I, initially it got a bit clunky because Alfred left suggestions, Gabe left suggestions. Ana, to her great credit, this year, because I'd always been sort of pushing her to like, you know, let's clarify exactly what's going on here. So she, out of probably anybody this year, very carefully detailed exactly what she wanted to do, what she needed. Umm, so she basically said I'm gonna be here for a week, what I want to do is like, last year I defined X working groups of raw materials. Which aren't set in stone, but like that's, that was my aim for last year, umm what I want to now do is use these working groups to go through a sample of Meso, Upper, Middle, and Lower Pal material and to see if there is any chronological difference in [unclear]. And it was like, and you know. I think in this amount of time I could look at 100 pieces from there, there, there and there. And I was like, fabulous! And then, like Gabe wanted to do this, and Alfred who was like eugh, and she got a bit overwhelmed, and was like no, let's go back to your original project, and she achieved it. And it was absolutely wonderful, and she has really cool working uhh, you know, working hypothesis and results. Worked out very beautifully. But, in a way because maybe by extent to be successful, to achieve her aims, she had to be a bit blinkered, which meant that again she wasn't as engaged.

Zack: That's actually a way to succeed, it's a mechanism that works for her to actually get this done.

Basil: So it swings in roundabout. So it was like, you know, a sacrifice in being completely networked, completely engaged, umm she was networked in terms of talking to the right people about stuff to get her project done.

A95 **Basil:** Well, I think, you know, it, it was great pleasure to you know, sit back across the table and watch, listen to Marie and Gabe and Alfred really talking in great detail about what they thought was going on in the site formation processes, what implications that had for sampling, what implications it had for the interpretative limitations of what they can say, and how things could be bracketed, how things could be rescued. They were already working on the narrative, they were like, it was basically, they were ready to roll with whatever we got. You know, it wasn't a matter of like "this is the result, ooh now what might this mean?", they were like really thinking through what this sort or,

where this might actually take us, and they were all, they were using the same language, they really, there was a great deal of mutual comprehension.

A96 Moreover, Marie wanted to come to site to sit down and go over the OSL results with Basil and Gabe and Alfred, to explain the results and dispel any potential misunderstanding. Meanwhile, Basil and Alfred were very nervous with anticipation, and in some car ride discussions talked about how they would write to her to find out more before her arrival. They were concerned with guiding the geoarchaeological interpretations of the landscape to decide how to prioritize the excavation of the site, and to guide Jolene in her interpretations of the lithics.

Marie, and a few others, have now left to take more samples, which must be done at night, out of the sunlight. She is also here for that more practical reason.

A97 Trench [redacted trench ID] and [redacted trench ID] have been unbackfilled yesterday for the sampling and the need to retrieve OSL dosimeters from their sections.

A98 **Basil:** and where you tend to have the umm, I mean there's, in terms of mediation, there's mediation in terms of like, Zack, I need you and Dorothy to get together so that Dorothy's skills and data dovetail and is integrated into the database. So that's like okay, I recognize an issue, lets make the space for this to happen, and try and mediate and then okay I think you guys are bright enough to talk to each other, and then you can come back to me in terms of like do you want this or do you want that.

A99 **Zack:** So how do you get ramped up again?

Basil: Umm, usually umm the energy comes externally, or I use external pressures to get me back up and running. It's like, oh, I've got 15 days to submit the next grant application, which with a number of our funding agencies involves writing what we did last year, you know, how did you use your budget, what did you achieve? Umm, so umm, and also the fieldwork committee at the [redacted] Institute. There are, there are two or three sort of umm deadlines coming up, that then kick me back into it, which is going to be a matter of like, okay oomph, now I'm going to have to need to send an email to Alfred, please can you send that photograph, Alfred can you explain what you mean by this, Alfred can you write your report up. You know I got yours ahead of time, I've

got your database report. Dorothy has sent through her report, but her report is not very interpretive.

A100 **Zack:** Oh, cool. How did you get involved with [the project]?

Jamie: So in Basil's class he would always talk about it, and then I was doing an unrelated project with him on data management and archaeology, or [redacted] archaeology, and then he was like, hey you like data, so he asked me to come here.

A101 **Basil:** I can't remember when umm... I think what I'm painfully aware of now, and I don't remember if I talked to you about this, is actually the significant role of somebody like you. Once, you know, as we've moved through time in the discipline, certain characters work has become upgraded, through digital technologies. Whereas I feel like your role is a very new role. You know, I think you can conceptually see your role as coming– once upon a time there would have been a cataloguer. Somebody who would've like, you know, documented each day, all the finds that came in or all the x finds, in a book or some kind of ledger. And that person knew what, you know, and then the assemblage would explode and the potters would go over there and the lithics go over there and bones over there. But there was like, you know, there was a notion, there was an in– somebody who was the cataloguer, who did the inventory, and sometimes wrote descriptions for some of these things. Umm, I mean, you know, now with databases, yes that role has, to an extent that's the 21st century version of it, but I think it's much more, the person who constructs the database umm is more intellectually engaged or has greater intellectual power in terms of now we can ask all of these things. Maybe some of these early cataloguers, you know, would a PhD come up with something in terms of like, ooh I've just noticed today's finds, we have sheep bones and we have these. I remember five days ago we were finding sheep bones and these, and maybe they're within [unclear] of that, through the centralization. But I feel like, cataloguers were always seen as like, you know, it would often be like the director's wife, or some lowly– it wasn't seen as–

Zack: It was a support work.

Basil: You know, it was support work, it was house keeping. Whereas databasing isn't house keeping, it's fucking fundamental to what we do. I remember, I remember a few years ago, in The Archaeological Process, Ian Hodder arguing very strenuously how, you know, there should be umm a cultural-soc–

cultural-anthropological perspective through our work. So basically anybody who is working abroad or in a different area, you should have a, you know, a cultural anthropologist working with you to, best practice and engagement and plurality and multi-vocality and whatever. And he made a really strong statement how he believed that umm just as if you applied for a major grant to do an archaeological project, and you didn't budget for a conservator, you'd be in trouble if not rejected, you should similarly be in trouble, if not rejected, for not including a cultural anthropologist. And I think I'm now of the mindset that, along with the conservator, if now moreso, a database person is absolutely crucial to any project. And having now been on the umm, the uhh the [federal funding agency] review committees for the mid-scale, up to 400,000 grant projects for archaeological projects in [our country], from applicants all over the country, doing their work all over the world, I'm still astounded that nobody every budgets for somebody to create and maintain and use the database. It's just taken as read, it's still this old school attitude of "oh somebody will do it", like "of one of the grad students knows Access", or you know, maybe the professor does a little bit of what they do. But it's not seen as this sort of specialist. I need to budget for a conservator. I need to budget for a metals [..] or whatever. Nobody ever budgets for this. And I think it's outrageous. Or I think it's like, you're going to have a really difficult thing. You know, you need to invest in somebody, and by invest that might be wages, umm or certainly there needs to be dedicated financial support, and the reviewers need to see that and go absolutely, too bloody [right].

A102 **Zack:** So umm, can you, well on the walk over we talked about getting into archaeology, but can you tell me in more detail about how you got involved with archaeology? Were there any significant events or people who motivated you, or whatnot?

Jamie: Sure. So I wrote about this on my application to my program actually, so I didn't know anything about any kind of archaeology or hominid evolution. And then I went to the Smithsonian and it had the display with all the different opinion ancestors, it's like life-size reconstructions. So walking through that was like epiphany, woah this stuff is real. Yeah, so I wanted to study that.

Zack: Yeah, that really is a significant event I guess.

Jamie: Yeah.

Zack: Were there any people who had a big role?

Jamie: Basil actually, because I took his class in first year, and that was my first time actually doing like a real kind of anthropology thing. And then, yeah, went into like archaeology from there.

A103 **Theo:** Hmm. I don't know. I think they're a bit sketchy. I don't trust the cloud. You know–

Zack: I don't trust the cloud either.

Theo: The first time you tried to send me something by Dropbox I had no idea how to do this thing. And I was like what is this Dropbox malarkey. And it's like, it didn't download properly, and I got you to send it again.

A104 **Zack:** Well I guess this is what this is all about, right? Umm, based on your experience, what are the main obstacles for the effective use of pervasive digital tools and technologies for archaeological work?

Theo: The diggers. Like–

Zack: How do you mean?

Theo: That's the main obstacle. Because we're stuck in our ways, right? Like we learn how to dig in a certain way, we learn how to record in a certain way, and when you throw the new thing like we go oh shit, it's new, it's complicated, it's change, we don't like change. But we need to embrace it rather than be scared of it, and I think that's the main obstacle. Like, yeah.

A105 **Zack:** So my next– I mean it's gonna be a bit choppy until we get into the flow. But um, can you describe like your role, or your specialty or expertise?

Jolene: Um, I'm a lithics specialist for the project, I deal with processing finds in the uh museum storage room, and um I uhh do a little bit of research umm too, and basically currently that's all, that's all that I'm doing. In the beginning I was dealing with organizational aspects, work in the lab, but now I have an assistant, who deals with that [laughs] And um, it's mainly, it's mainly uhh, I don't know how to put that, in my opinion it's mainly, it's museum-like position, you know, like people in museums have, but it's also, it has these aspects of research, so, you know, its its nice.

A106 **Zack:** How do you stay systematic, in that sense? How do you stay consistent? How do you do that?

Jamie: So I try to either use the predefined vocabulary that's already there, in wherever I'm working with. Or if there's not one, then I try, like when I'm just typing stuff in, to be consistent with myself, and then going through after

the fact. The good thing about MySQL is you can easily, kind of, batch edit. So I check, kind of, consistently, to make sure that, you know, capitalization is the same, terminology is the same.

Zack: Uhuh, uhuh. How closely are others involved in the various processes or practices that you do? For instance, what is the impact others have in selecting which methods to apply, or in setting up used equipment, or in documenting the materials in a certain way, or in dictating what kinds of outputs should be presented, all that sort of thing?

Jamie: Coming into this one, like almost entirely you and Gabe had already formatted that stuff, so I'm kind of trying to fit into what you guys have done. And then obviously we're influenced by all the, like, lithic analysis and the context work that people out in the field are doing, because we're kind of beholden to what they record and how they record it.

Zack: Yeah. So you say it's very integrated with the team?

Jamie: Yes, definitely. Because everything we do is, kind of, what they give us.

A107 **Zack:** Interesting. That's interesting. Umm. So, do you... What do you think people do with the information after you fill it in on the form and after you put it in the database? What is your, how do you project the future of the data you make?

Ben: What happens? Uhh... I would assume they get read or analyzed by someone.

Zack: How?

Ben: Good question.

Zack: Sorry, I cut you off there, but if you want to continue...

Ben: No, I don't know if I was going to say anything other than that. Uhh.

A108 **Zack:** Do you follow a specific method or approach, as prescribed by some predefined method or framework, or do you think that some sort of (special thing) applies in this work?

Jamie: Umm, I mean, like I've had classes about how to do basic data management, so you try to follow like best practices from that, as best as you can, but the work we're doing, kind of by nature, is it's own thing. So there's not really like a procedure for how to, you know analyze lithics at three levels properly, so it's a lot of winging it.

A109 **Zack:** Nice. So you mentioned earlier that you uhh, you uhh, you keep a word document. Is that the only way you document your own practice, in either a professional or personal capacity?

Jamie: I also write in a journal every night, but that's more like a personal and professional journal.

Zack: Do you uhh–

Jamie: I keep a calendar

Zack: A calendar? To [unclear] when you do things? Uhh, do you uhh, have a blog or social media that you do any of this sort of stuff on?

Jamie: No, nothing.

Zack: No? Okay. Uhh would you consider sharing, sharing like your work document, to other audiences beyond yourself? I mean, who is the intended, first of all, who is the intended audience of that like, that sort of log that you keep? Like what's its purpose?

Jamie: Its primary purpose is for me, so I can see, like look back on what we were doing, for example, or what I still need to do. Umm, secondary purpose is umm, secondary purpose is in the event that, you know, some of the supervisors or someone like Basil wanted to say, okay, what have you been doing, or hey what did you do with this thing, I can look back and say, oh we changed it on this day and this is what I've done since then to it.

Zack: Is it, so I meant do you consider it to be a public, like would you be apprehensive about sharing that?

Jamie: Like it's, yeah there's nothing personal about it. Like it's project work, so.

A110 **Basil:** I mean, I do, I am slightly, there is a slight frustration on the Gr– I'll be interested to see how the [local] Palaeolithic community runs with this. It's a, umm–

Zack: You mentioned they ran a seminar series one time?

Basil: Yeah, I mean, you know, it's it's a very interesting, umm. It's the one aspects of [local] archaeology that is almost entirely, it's dominated by [local] archaeologists. You think of Hellenistic archaeology or you know maybe maybe Ottoman and Byzantine. But, you know, I mean, Byzantine, there's lots of foreign scholars working on that. But, you know, the Bronze Age, the classical period, you know, the [local] voice is almost a minority. The Palaeolithic is overwhelmingly [local] scholars, most of whom are based in [this country]. Aeris

is based in Germany. But, you know, it's [various prominent archaeologists], yada yada yada. So, we're a real rarity being foreigners in that space. And I think we've tried to be, you know, lots of doffing of cap and respectful. But it's it's it's a weird space to be in. I find it slightly perverse that you know after, I think they've had the Palaeolithic seminar running for about three years now and we still haven't been invited.

Zack: Hmm, that's interesting.

Basil: Umm, and I do also get the impression that there's some fairly deep divisions amongst those scholars as well, which is is par for the course. Any field, whether it's Bronze Age, Hellenistic or what have you, there's gonna be, you know clashes. And I, you know, I've I've been playing the political game, for want of a better phrase, you know, since my PhD days. Umm, I had to do some very careful navigation between scholars who really disliked each other back at that time. So, so it's nothing new to me. I'm finding it a bit tir–, a bit tiring. And like, you know, I'm, I will respectfully reach out to scholars. I will invite them. We've hosted some of them. I get annoyed when I hear through the umm, the grapevine that, you know, so-and-so who we hosted then kind of completely slags us off behind our back. But, you know, you try not to get sucked into it. Which is why, you know, I think we're interested, you know, the fact that Denise said such great things about it is is much more meaningful for me. You know, as you go through, you have certain characters you look up to in terms of like, well, if I can convince them, then I know I'm on the right track.

A111 **Basil:** I mean, so one of the things I was very careful to do once the paper was published, and because a lot of listservs, you know, allowed to like attach, you know, send attachments. The nice thing about it is, because it's open access, I basically was able to send a message to everybody on [redacted] and everybody to the prehistoric Society Aegeus through Facebook, umm with like, hey, this is our new paper, it's free, here's the URL, go for it, fill your boots. So that gets things out very quickly. But it's it's it's, you know. So much is published hahaha. It's very easy to genuinely just miss things. So I was frustrated that the scholar whose textbook has just come out on the [region], I think she genuinely just didn't know about us. And that's upsetting in terms of like, you know, you gotta, it's all about profile raising and publishing in the right places. But moving forward, yes. I would take umm uhh ignoring– I mean, in a way, you know, you'd always been kind of taught that like rather than, you know, it's

one of the things you try to get out of as a graduate student, you know, you should not be using the word contra in your paper or whatever. I just remember like as a young graduate student like contra Renfrew 1962 and contra so and so, and like you you're being, know, I know better than you. And eventually, if you don't, if you seriously disagree with somebody and it's a bit of a tangent to your argument, you just ignore it. If it's like you are coming up with a new hypothesis to explain the emergence of the palaces, then it behoves you to review previous scholarship on the origin of the palaces, and at some point you might say, yeah ultimately, my work springboards out of this. But conversely, it kind of negates so and so. Yeha, but you can always say, you know, in the light of new information, we might, I might now say that this looks less likely. There are polite ways of doing it.

A112 Zack: That's interesting. I didn't realize it was such an issue that relates to other sites as well, and that you're using the other sites to inform you.

Basil: Yeah, I mean the Francthi Cave is the best published sort of sequence. Umm, climatic data, there isn't a huge amount of climatic data out there in terms of lake cores and all that sort of stuff because there's not many lakes in [this region]. But, you know, I think we're sort of within a broad enough climatic area that you can extrapolate over certain distances. So I mean, you know, what one, I mean, what I'm still trying to struggle is like how we tie the micromorph and the dates with actually saying when people were there. Because again, all of this is like, the dates are terminus ante quem the hearths are actually telling us when the fireplaces were there. So that's around 12-14 thousand. So we know people were there around 12-14 thousand years ago, (so we could figure out) exactly how cold or warm that is, but, you know, that involves people going by boats but they're like Homo sapiens so you know, gee whiz, we already knew that. And in fact, 12-14 thousand years ago is around the date we start seeing the first obsidian going form [the region] to the mainland, so that dovetails quite neatly.

A113 Zack: Yeah. So you're fitting in with, are there any other– so you mentioned that there is this publication that came out by umm, Aeris, and there's this kind of narrative that you're sort of fitting into, or sort of, you know, in relation to the, you know, getting back on track with regards to the [regional] Palaeolithic stuff. Is there, do you see yourself as one part of a broader narrative? And if so, can you sort of situate other sort of, perhaps, similar studies or projects in

relation to yours?

Basil: I mean, I think I mean, in terms of our intellectual heritage, we very much sprang, the discoveries and the claims [in the region] very much represented a catalyst for us. I mean, certainly, going back to [our site] and trying to figure out what it was, you know, would have been a project we'd have done anyway. But like, you know, the claims that Bruce and Richard were putting out sort of inspired me. And I thought that there was an opportunity to contribute on the back of that. We have been very much supported by those characters. I think initially there was a rather sort of junior and/or naive on our behalf desire to immediately leap into that debate and we categorically didn't have the evidential basis. And I think, as we've gone, the, you know, the intellectual arc of our project, I think we've become more cautious. We've gone from the maximalist perspective to more of a minimalist perspective. I think we are quite upfront. We lead with a sort of a critical reflection on the interpretive limitations as much as the potentialities of our project. It's all in secondary deposition. All our dates are terminus ante quem. We can't link it up with the sea level. You know. But, so we've sort of celebrated– And I think that, you know, to a great credit, I think a large part of umm, I think that Gabe is very much a word of wisdom in this process. He tends to be a much more cautious scholar. And he's a he's a very good partner for me to work with. I tend to, if, you know, I'm off of the leash on my own, you know, I might go all over the place. Whereas he's like, yeah, well, you know, he's always crunching down on my sort of language, in terms of, he hates it if I say a like lot, it!. he's quantify If you're going to say a lot, what you mean by that? Umm so I think, it's not like, and again, I have to be very careful about all of this in terms of, I don't want to sort of turn around and bite the hand that fed me initially. So I don't want to be in a position whereby I now turn my back on people like Richard and Bruce who made a big hoo-hah about seafaring and pre Homo sapiens populations and yada yada yada. I think we're moving away from that position, or in terms of like we dont think that we can necessarily contribute to that debate. We're not necessarily arguing against it. It's just we're no longer going to be, you know, hand-in-hand fighting that fight. Conversely, and maybe this is a junior senior thing I heard on the grapevine, or Richard mentioned to me at the conference that he and Alfred are trying to write a little piece for Science about the evidence for pre Homo sapiens seafaring more generally. Now, obviously, Alfred is his own scholar, thre's categorically not a party line in terms of like

this is what we stand for as [our own] project. If he wants to go off and argue this, and indeed, use the umm the uhh [our site's] data to contribute to that, that that's fine and dandy. I don't see it as like a, you know, we will have to si– sing off the same hymn sheet. I tend to find their approach a bit maximalist. I think their argument is like if we if we throw 30 examples at you, you're just going to be overwhelmed in terms of oh gosh, yes, I think it must be. My point, I think at this point, I think I'm probably not exactly going 180, but I think I would now start by saying, yeah, but 28 of those examples aren't well dated or are said to be or look like. Umm and actually there's only two and you can argue that two is the exception that proves the rule. And actually the other major implication of Aeris's argument– So, you know, the logic of Richard and Bruce is a) the date of their site, or the date of the material, is at least a hundred and thirty thousand years old. Homo sapiens are nowhere near, uhh, they probably haven't even left Africa at this point, so it has to be a pre sapiens population [in their area] it's that old. And the other part of the argument is [their area] has always been an island through the Pleistocene, ergo pre sapiens seafaring. Originally, there was one major critique of this, which was certain people, perhaps rather unfairly, because then seeing the material, argued their lyrics weren't actually cultural. They didn't believe there were cultural at all. It was, you know, whatever, so it wasn't an archeological site. Now, the argument you can bring to bear is that if you buy into the argument of Aeris with Homo sapiens in [another region] at 210,000 years ago, then maybe it was Homo sapiens on [their region] a hundred thirty thousand years ago. So, to an extent they've just had, umm, you know, the rug completely pulled out from underneath their feet, which thus leaves you with only the example of Flores in southeast Indonesia where we have probably Homo erectus. We don't have any skeletal remains, but we have archaeology on what was definitely an island a million years ago.

Zack: Yeah.

Basil: So that that's not Homo sapiens. But, you know, once you strip it down that basically you're dealing with one site, which could be the exception that proves the rule. So I think I think, I think our our narrative arc is umm, the way forward is to be cautious, to be respected. If, know, you strategically, we can come up with a hype–, a hyperbolic version of cautiousness that gets us still into Science Advances and the like, then that's the route I want to take. But I think, you know, we've probably matured over the last few years. And by extent, if

you were to see sort of camps, I think you probably can talk about camps in the in the discipline, then you would see people like Richard and Bruce and maybe Alfred as kind of being maximalists. We will read the most we possibly can into these data. And I think we're moving, or certainly Gabe and myself are much happier, and I think Gabe always was happier to be much more of a minimalist, more cautious. Because the risk is you end up just, you know, you produce some fantastic quality data, and then everyone just ignores it because of something silly you've said.

Zack: Yeah.

Basil: So doing you're a disservice to some good quality data and some really good work done by colleagues on the project who may not align with you anyway.

A114 **Zack:** There's nothing unique about the apothiki?

Agatha: The place? No, except we share it with [redacted].

A115 **Zack:** Well getting back to like communication, like when everyone is sort of like scattered, umm, is it mainly over email, or, like when do you, like last year at the AIAs, when people got together, and you sort of parlayed a little bit, umm what other mechanisms, and like how do you really inform people to keep up to date. Like maybe an example would be like how do you keep people who didn't know about the new dates, how do you get them sort of like into it?

Basil: Umm, most of this is done by email. I'm not sure if I've ever Skyped with Gabe or Alfred about these two things. Occasionally I will have to Skype or phone Jolene, but that's because Jolene is a terrible communicator, and so I have to poke her with sticks. Umm, but like I don't set up sort of like Skype meetings with five people striking in. Umm, the AIAs have historically, the AIAs and the SAAs have historically uhh provided those interim excavation contexts. I think, you know, this is very different, it's very much a North American scalar thing, you know, if you were running an excavation from the UK and your collaborators from elsewhere, and in the UK you're just getting together, it's not too much of a hassle. At the AIAs you see recurrently that's where excavation teams meet, discuss, plan the next year face to face, over drinks, over memories, you know, celebrating what went on the year before, so seeing Gabe at the SAAs or seeing Alfred at the AIAs, well Alfred didn't make it because he forgot his passport... Umm so usually it's that sort of thing, but then also, you know the February study season, February this, sorry October,

uhh this October, Gabe is gonna be there because Gabe probably wouldn't be there otherwise, but because he bought his ticket to come this summer, and then because of his injury, he changed his ticket, so he'll be there in October, and Alfred will be there in October, uhh because Alfred is going to be in Athens, and I'm gonna be there, and Jolene is gonna be there. So that, those kind of contexts, I'm sure, I'm sure that's not dissimilar, we probably get to meet like that a bit more than some people, but you know, the AIAs, the SAAs, are traditionally I think where a lot of people get together, and uhh do their planning.

A116 **Zack:** Were there– so, was it audience you were expecting to get. Or who, who, like what audience were you expecting to reach? And in what way has that influenced this kind of percolation lag that you just described?

Basil: Umm, never I've dealt with umm, a phenomenon like Science Advances in terms of, you know, a) it's open access, b) it's very high profile, c) you know, they have a system in place, they get used to do a press pack and stuff. So I think we have reached a lot more people. I think, if if I'd started to receive emails from German professors or Spanish professors or British professors who wouldn't read our usual journals but read Science Advances or saw it in the press, I think that's where I will appreciate somebody like, oh, that's just really made a big difference. Somebody I haven't sent it to, somebody who's not a friend of a friend. Somebody who wasn't in a conference audience, who comes across this publication. But honestly, I– there is so much being published that you just can't keep on top of it.

Zack: What about the OSL community? I know like umm, there was a lot of emphasis, especially in the supplemental supplementary materials, about the OSL dating and in the method section and all that. Was there a lot of reaction from– I know it's kind of like it's own community in some ways. Isn't it?

Basil: Absolutely. Yeah.

Zack: Yeah.

Basil: And again, it was like, you know, there's I– there was a moment where I had to start plugging in the potential reviewers and the reviewers to block for the article. And I'd reached out to my French colleagues. But I was I was impatient. So I looked up a bunch of people, including [redacted] whats-her-name, who works at [redacted] and places. So I put down some of these names. And whoever they sent it to was quite sympathetic. Because I remember

mentioning to Marie, or maybe this is when we were originally dealing with Nature or Science and it didn't go any further.

Zack: Yeah.

Basil: Because I mentioned to Marie, like oh what about [redacted] so-and-so? She's like, oh my god, not her, no, she's like, just a nightmare, just.

A117 **Basil:** Myself and Marie are the corresponding authors, so I wouldn't be surprised if somebody contacted me for geoarch, but, because that's who we're telling them to contact. But then I would almost, I would deflect the decision and the response to come from Alfred as the primary stakeholder in that material. Umm, and, yeah I mean, it depends on, I mean, while this is a major publication this isn't the final work on these datasets. Alfred might feel, to a large extent, for the OSL people yes, I don't think there's anything more they would want to say about this. But for the lithics, we feel like there's another, more exclusive, or more, let's say more specialized, which by extent becomes more exclusive, uhh paper that needs to be written about the lithic assemblages with far greater quantification, assemblage structure, ultimately giving all the data that some people might contact us for in the first part. Many more illustrations, you know the classic sort of like, here's some examples of x, and here's some other sites where you find x, here's our comparAgatha, and all that sort of stuff.

Zack: So this alone wouldn't satisfy lithicists.

Basil: Yeah. So yeah, because at the moment our references have been relatively broad stroke, you know. We have some material from the Mousterian, here's a general article of the Mousterian in [the region], which summarizes a whole bunch of site. In a more detailed article we might actually want to say ahh well, from the [unclear] cave you have x, from the [unclear] cave you have y, and go into more nuance.

A118 **Basil:** Andreas did the micromorph of the block that was taken from the cave. He confirmed that all the material was basically wash. Our fear was that like, rather than digging stuff that was in the cave— because originally we thought that it was, you know, it was completely sealed, and by extent anything from inside the cave was deposited in the cave. Then in fact it turns out that really the cave is a false cave because it's, you know, a little crevice umm and some rocks had broken off and capped it but there's still some gaps, and stuff has squeezed through toothpaste-like and created this whatever. But then apparently within

this matrix was soil that had been displaced from higher up the hill of a type that is not to be found anywhere on the hill anymore and is some of the oldest material we've come across. What significant that is, I do not know, because he slightly confused me.

A119 **Basil:** And so also in terms of like, you know, we have the feature sheet, which would be used much more regularly I think in a British or a more normal [local] excavation, whereas like we have, you know, the one yet to be defined hearth complex, which I mean, one has to be careful about, and I'm just thinking about that today, you know, Andreas has emphasized that, you know, the hearth are in fact hundreds of firing events. So bundling that together as a feature, you know, one has to be wary about what that represents.

A120 Andreas tells a very nice monologue narrative to relay his interpretation. Alfred, and Basil, relate their experiences and the collections of [the project], to Andreas, trying to see how the narrative can be leveraged and how they can contribute developing and refining the narrative.

They together explore potential streams that might be followed. Seems like a negotiation of sorts.

Alfred proposes a possibility.

Andreas evaluates its viability and potential to be integrated within the current narrative.

Basil relates similar efforts that have already been made, tempers the exploratory drive, and offers a pragmatic, project-oriented perspective.

Basil is standing still and observing conversation between Alfred and Andreas. Does not contribute, except to interject once in a while. Difficult to mind read, but seems that he is evaluating the comfort and expertise among the two others, evaluating how certain they seem.

A121 **Andreas:** So, in the sequence here, see if you take, first of all the lower half with the clay, is certainly a long, the result of a long activity phase, weathering, transformation. Now that I see it more clearly, it appears in several places. It's a kind of uhh, an environment that, because it's [unclear] clay, sometimes it retains water. So it's a kind of, not exactly stagnant, but you can cal it something umm... but during the wet season it can be quite muddy or something like that. Now that I see it here it looks like being at the expense of any real [...]. This one is probably weathering, and down to, so this is something like the

clay that you see at the bottom. I'm talking about a lot of time here. Okay, this is tens o thousands of years at least. Heh. I'm not a show-y person but I think the muddying, in order to [...] alteration of the bedrocks, this is old stuff. Uhh, then here you have the co-variation and some sand blown in. And on this side, on this side, is the, the fire base , sand, sand right below the, the hearth. The blown sand of, by the base, sand. This was, now the sand that, the sand that was actually related, you had, you had probably a stable formed, some kind of small weathering of the sand [...], it could be aeolian. It has to be aeolian. I can only imagine the processes that brought here [pure sand]. This sand is de-calcified, which again implies kind of, some kind [left on] the surface in order to de-calcify. And on this surface, the guys came and put fire. Actually the matrix of the black stuff is sand again. I was surprised when I saw it but it's, like if I saw you tomorrow or in the afternoon or the evening, I will bring, I will bring my, my computer and my uhh laptop, you can see [...] a thin section in a picture that's pictures of black sand. I think you can see with the loop as well, with the magnifier. So the whole thing is kind of in play but not in sequence. [...], de-calcified uhh again, which means some water was circulating, the [...] was [...], during the winter, the rainy season, everything was moved around. But you know, moved around. So the, probably, for example, this area, kind of [...]. I [see] a few pockets that resemble more ashy remains. Of course we don't see any more ashes because they have been dissolved away. Actually what you see under the microscope is just sand grains surrounded by [...] made of very fine charcoaled dust, dust charcoal. That's why you don't find, I guess, charcoal inside, probably few bits.

Basil: Yeah, it's nothing. Yeah it's a very very tiny amount.

Andreas: Yeah, I mean okay, it's like putting a fire down on the sand. You know, the sand is something that moves, always, around. Even people when we're trampling it, you know animals, you know [...]. Sadly, nothing would survive, [...] so much not in a [...] but would end up in dust, something like that.

Alfred: Oh well.

Andreas: But still, it's [held up] in place, and made on the, on the material that is just below. So they are, let's say, kind of the same, umm, story.

Basil: Excellent.

Alfred: That's good. Yeah.

Andreas: I mean you can date, I guess the date of both events will not agree.

The accumulation of the sand below and the fireplaces on top, they might be about the same age, more or less. I mean, if you are lucky and you [...] you can separate these two events, it would be nice but I think it's, it wouldn't be very [...].

Alfred: [something about carbonized remains]

Basil: We have a few carbonized remains. And we, we just took another 167 litres of flotation so our, we have our archaeobotanist coming through next week.

Andreas: Did you say carbonized or carbonated?

Alfred: Carbonized.

Andreas: Yeah, then of course.

Alfred: But I mean–

Andreas: It is, there's no doubt about it.

Alfred: Yeah.

Andreas: Actually yeah, ok I forgot. There's quite a few burnt bone inside but are reduced in the size of sand. Let's say less than a half a millimetre, but they are burnt. Again, because you know, they are so [can't hear because of the sieve nearby], they've degraded in that small sizes.

Basil: Well, that's the only bone we have from the site so far.

Andreas: I can show you under the mic, I mean they are tiny like, you know, sand grains. And they are burned too.

Basil: I wonder if we could do anything further with that.

Andreas: Other than dating, I don't think, what else? Yeah. Yeah, I think more or less, you can't do more.

Basil: So what–

Andreas: Ahh, I mean, ok, in theory, some more fancy biochemical analysis? I don't know, I don't know if these things have survided. But why not? There have been, lately, some umm biochemical analyses on these kinds of stuff. Right, and you know

Alfred: Lipids?

Andreas: Yeah I don't know, lipids or whatever, maybe it's different, maybe not lipids. You can say whether they were burning plant, or what of plant possibly. I'm not, I'm not sure if all lipids is fat.

Alfred: [...]

Andreas: Well, this kind of analysis, I mean the tools are [...] or ICP, I don't even know. [...]. You want to try [...] you could end up doing it, but I have

seen people doing it with palaeolithic [...] see if it works.

Basil: Well we were gonna try it, we're gonna take some sample for aDNA for our, for lack of–

Andreas: No, I think that's absolutely right. I know some people from [an archaeological project] in Spain have done this kind of stuff.

A122 **Basil:** I mean, Jack has, I mean Jack is obviously very important, because uhh he just a year ago, or two years ago, wrote this book on Palaeolithic seafaring, umm and, in the Mediterranean, and so when he wrote that book we had just started, so we were tantalizing for him without being able to say anything much one way or the other. He's been one of the vocal critics in terms of like, you know, if we're gonna have these debates, you know, you gotta have really really good evidential basis, you know, these gold standards. And umm, which basically for him and like Evan, is like, it's not, it's just not convincing enough when it's so im— when the ramifications are so important, we need the best quality evidence possible. Which at this point negates the utility of survey. You know, finding stuff on the ground that looks like a Lower Palaeolithic X or a Middle Palaeolithic Y is just not good enough anymore. Particularly, and our site has always been, our site because it's a quarry site, umm, tends to produce very large weird tools. Because you're dealing with big pieces of rock, and you're banging them about, and you could get, you know, this sort of implicit or explicit critique by some people out there, is like, maybe what you got, you think it's old because it's big and pointy, you think it looks like a hand axe but actually it's a ne— I mean when Denise saw our umm emery handaxe she said "aha, this is the hand axe". She didn't correct us, she agreed, it looks like a hand axe, but she says "meh, maybe it's Neolithic, maybe it's like you know, a quarry tool". You know, you need these big, you know, quarry sites are weird, umm they're different from other kinds of sites, and you're going to get some weird bunnies, and maybe if you don't know exactly what you're talking about, you might mistake umm large query flakes for being early things, because they're big and they're rough. But you get big rough things at quarries globally, it doesn't mean to say they're Palaeolithic, they're preforms, or they're testing, or they're, you know, what have you. Umm, I remember years ago, there was a little vanity amateur publication on Melos, uhh and some guy had basically gone to the quarry and picked up all these enormous flakes, because you get big flakes at quarries, and he had like put a handle on one of them and said "look!

This is a Palaeolithic axe!". And it was like oh my god, you know. And it was like, there was kind of like that logic being banded about. So umm, yeah, I would have, you're always weary about asking people like were you a reviewer of this paper, because it's gotta really be anonymous, but I would imagine that he would have been one of the reviewers on the uhh recent Antiquity piece that Richard was involved in, uhh there's a publication of an alleged hand axe, Lower Palaeolithic hand axe, from [nearby region]. An object he found, Jack himself must have known about it for years, because apparently it was in a display case in [the research institute], and has been since like, you know, the '80s or whenever [redacted] found it. Umm and, you know, he would no doubt have been very cautious in terms of like one piece, one artefact, does not make a, you know, who knows? Maybe it was, maybe, maybe it is Lower Palaeolithic, but maybe somebody found it in France and brought it back from their holiday and dropped it in a field by accident. There's, you know, the idea that, you know, it's not, you know, to find Lower Palaeolithic [in that region] would be a huge deal because of, it's an island a long way away from the mainland, such early characters are not meant to be able to do that, umm and so, you know, to make that claim, it's not just like oh, check, we have another period of activity [in that region]. The ramifications for this are very very large. So to make such a bold claim you really really need good evidence. Umm and so Jack, along with Evan, is one of these people who are claiming, or arguing that, you know, to really start re-writing prehistory in such a radical way you need gold standard data. You know, you need excavations of undisturbed umm prehistoric material, in situ, well stratified, that you can elicit associated scientific dates from, and then we can start having these debates. Stuff lying on the ground that looks Lower Palaeolithic is not good enough to start re-writing the data books. Umm, and this stuff is textbook re-writing. It has ramifications globally, for how we understand what's going on. It's not just like a micro, you know, OMG, we've just extended the occupation of these piddling islands back a few thousand years. No, it actually has ramifications for global understanding of humanity. Umm, so Jack was, I, you know, he approached us, I'm sure if I, you know, I would have gotten around to inviting him the next time I bumped into him at a conference or what have you. Umm, but yeah, so he was another. Evan is somebody, and Matthew are people who have open invitations to come and see what we're doing. Because they're, not only are they scholars of the field, but they have, you know, Matthew writes at a very large level, and so if

he starts talking about us, other people will notice. So you know, some of this is, you know, sort of like profile raising.

A123 **Zack:** Yeah. So back to the work on [this project], how do you see your work contributing to the overall aims, and if you have a conception of what the overall are...

Jolene: A lot hahaha well they're only dealing with all of the material that's excavated and giving our impressions for the reports. So that literally sets up the basics of how we see, the site.

Agatha: There are no bones, there are no shells

Jolene: How we see it as human activity

Zack: There's a lot of pressure, then

Jolene: So, yes. Of course. So ummm there's lots of pressure but it's also very rewarding when we get the confirmation from the outside.

Agatha: Like we did today

Jolene: It hurts when we don't hahahaha so

A124 **Basil:** It's, I mean, yeah. Umm, now, for a very, you know, for decades, there have been accepted means of scientifically representing the archaeological record, umm to act as evidential bases for your claims. It's understood, that you know, it's impractical for every single interested archaeologist to come to see your site, to see your material. You could be in Australia and the site could be in Peru, umm and so, without that tactile, immediate relationship with the evidence basis that somebody's uhh excavated, there are ways of representing it through photography and line illustration. Umm, that always used to seem to be enough, but it seems like again, it comes down to this contentious nature of our site. The fact that we are, we allegedly have such an early site where such early sites are not meant to be, I'm starting to discover that some of what used to be the accepted means of, accepted ehh evidential umm bases, don't seem to be good enough for everyone. And so it's been very important to have people like Denise come and see this stuff in the flesh. Yes, she's seen the drawing, yes, she's seen the photograph, but for her to see it first hand, handle it, pick it up, query it, umm look at, look at assemblages, as opposed to cherry picked illustrated pieces, has been fundamental to convince her that we really have what we say we have. Ditto Jack. So I think, you know, because I still hear through the grapevine people, you know, muttering, that oh you know, maybe it's this, maybe it's that, you know. And my colleagues over in [the neighbouring

region], I mean, what's interesting is that, you know, my colleagues in [that region], Richard and Bruce, they were the first guys to find the Palaeolithic stuff. Denise doesn't believe in that material, so other people do not believe in that material, even though they've done the scientific representation, they drawings and whatever, umm—

Zack: has she handled it?

Basil: I— she's been there, she's been to the site. I don't know if she's handled the material because the material I think was in [another city].

Zack: Do you think that if she were to handle it like she did at [your project] it would, her opinion would change?

Basil: Well I worry that the fact that she's been there and she had a tour of the field, and that's... They have a problem because they work with quartz. Quartz, having just studied some of the material, umm of Richard's Mesolithic site, it's really difficult. Umm, I just studied the material, and I hope I was consistent in my inconsistencies, but like I worry about some of the site. Was I really seeing what I wanted to see? So umm, the visitation of these scholars... Now, there's scholars and there's scholars. The very fact that, you know, to an extent we just tell everybody else bugger off, we don't need you to come anymore, because we're gonna say "see Denise, pers. comm. Denise is gonna go off and tell other people that what she's seen, she believes in, and that's gonna be good enough as a stamp of approval for a lot of people. So that, that's a different, that's—

A125 **Basil:** So the superstar material that Lauren was excavating, that we thought was Levallois blade cores, she disagreed. She thinks the material is fabulous, she's never seen this material before in [this region], she thinks it's Aurignation and looks much more like what you would find in France. She's blown away. She's blown away by–

Zack: But it's still Middle Pal?

Basil: Very early Middle Pal. But, we had shown her our superstar pieces. This is where it—

Zack: I was in the trench that first day when we, and I was like cores, wow, tons of them.

Basil: I mean that stuff is— but we had shown her some of our superstar pieces from the survey, like here's a Levallois point, classic thing. But she's like hmm, it's just one piece. Haha you know, it's just like, A, she's not exactly ship's

been gone, but she has very high standards.

Zack: So is she sticking with, is she saying that M. Pal was a thing though?

Basil: She was like, so she was looking at these, these little bits and pieces, and like, well, the stuff, you know, we showed her a whole bunch of stuff, it's like, we think this is Levallois, she's like no, it's this. And then we show her some stuff from the survey and it's like, hmm it's one piece and it could be, but it's just one piece, that's not really enough. And then finally we showed her the material, Jolene showed her material from [trench], Alice's new trench, and she's like yes, this is Middle Palaeolithic.

Zack: Ah, okay.

A126 **Basil:** Denise came and looked at the stuff and she said: oh, 90% of this material, you should just take it back to the site. And I was like oh, that's a very liberating statement. So, it's like, yeah. Because, because it's a umm, a quarry site, we've just got stupid amounts of stuff. You know, the amount of techno-typologically diagnostic material is relatively low, and particularly with regard to actually finished, modified tools, is very low. So like, you know, 99% of our stuff is like undiagnostic material, apart from it's diagnostic, but you can say this is Upper Palaeolithic. But like most of this stuff if rolled down a hill, it's mixed and blah and whatever. So yeah, we might be able to say that these flakes are Upper Palaeolithic, but actually the end products span the Aurignation to the Gravettian, so this particular flake, we just, there's nothing you can do with it. Is it worth actually saying that there is a... So I think what we can do, but we have to have this conversation out loud with each other, can we justify, like, so you know, one of the contexts I dug, we had 36 bags this big coming out of one context. Now, there might be a very good argument to make, but we need to make this argument out loud to each other and write it down to see if it makes sense and whether we can defend it, whereby of those 36 bags, we're just gonna take one bag and record level 2 all of it as a sample, and then we're gonna rapidly go through the other 35 bags to make sure that there isn't a hand axe in it, take anything sexy out of it, in case we want to draw them, and then the contents of those 35 bags, we put it into the car and we take back to the site. And we do that with every single context we've dug.

A127 **Zack:** It's a different kind of engagement than a collaborator though.

Basil: Yes. And uhh, and the rhetoric for me is not going to be so much for investment—

Zack: It's gonna be an arms length—

Basil: Yeah, it's gonna be, in this case, it's like a tactile veracity.

A128 **Basil:** But like in terms of the visitor thing, to go back to that, umm, yes, you, having visitors is partly profile raising for the site, community engagement and community creation and networking, uhh we also brought Denise over in part because we wanted to impress her, but also we wanted her critical input and we were kind of, you know, Jolene and I can't publish all of this. We weren't necessarily looking for her to come in to publish with us, because she's a very strong character and I think she might overwhelm us, but we were sort of hoping to maybe get suggestions from her as to who else we could bring in, say like a postdoc or a—

A129 **Zack:** Are you including any supportive documentation, such as data tables, figures, details, methodological descriptions or metadata?

Basil: Yes. So umm if it's finally accepted, it will be in the journal Science Advances, which has umm, it was, in the end it was about an 8000 word limit, uhh which I think, it's fairly short. I mean originally when we wrote it, we wrote it for Nature, umm which was like a 1500 word article. Umm so... which is like very concise. Umm, now, with all of those venues, you know, it's more and more common that people obviously are reading stuff online, all of these venues, including Science Advances, should they ultimately publish it, umm we, they facilitate and encourage the publication of supplementary online material. So to an extent that's where you can give a little, you know, a certain amount of data dumping. Umm, where you can go into the really nerdy– and in a way it's great in terms of like, you know, your main article, it's a relatively flowing piece of narrative. And then, you know, see supplementary online materials for a detailed breakdown of the stratigraphy, for a more detailed discussion of the lithics, for a more detailed breakdown– actually no, at the end of the paper you're then allowed a materials and methods thing, which is where you go into great detail for the scientific umm uhh audience, uhh the nature of our dating techniques, et cetera. So, quite snappy archaeological big picture narrative, expected materials and methods for the, sort of, the main paper, and then supplementary online materials, that's where you can go, you know, you can write hundreds of pages. Umm, there is an expectation... so, this is an open access journal, umm.

Zack: Entirely?

Basil: Yes.

Zack: Not a hybrid or...

Basil: The Science Advances one is open access, which if we're accepted will cost us 4500 dollars US, and one of the things they ask us... so, each author is expected to sign a quite detailed form that I've not hitherto dealt with before, which basically gets you to stipulate quite clearly what your contribution was in the paper. So at the end of the paper is says, you know, use your initials, [redacted] for myself, umm director of the project, I kinds worked on the lithics, co-wrote the paper, and then you know, other people, geoarchaeology, blah blah blah, and et cetera. But then we also, online, have to sign these documents, in terms of, you know, did you produce any algorithms? Yes, no. Umm did you, were you the person who raised the main funds? All these projects, in great detail. Umm.

Zack: What do you think the value of that is?

Basil: Umm, given that it's... I'm not entirely sure why we had to do it. I'm sure there was some kind of blurb, which, you know, it's one of these things that you have to say oh I accept, you have to do it, as opposed to really ponder it. Umm, that I don't think is published, so whether there's, who evaluates that, I'm not quite sure, or it's exact purpose. I mean there is a slight discomfort, potentially, in that one of the authors is essentially a political appointee that we know has to be included, umm and I'm not quite sure where on that long yes/no list they would have hit yes. I don't know if that would then trip anything from the journal in terms of like he can't be involved, you have to have written something or given something. Umm, but yeah. So, but umm one of the other things they said, is you have to be crystal clear in terms of you have to provide your primary data that supports your arguments. Or, and we took the or route, because we're still organizing our data to be in a umm, a more accessible format, umm or basically you say it will be made available should you contact us. So we've, we've included that required statement. If anybody wants, you know the uhh, the numerical data that underpins any of this stuff then we will happily hand it over.

A130 **Theo:** The context sheets and the trench report are more, sort of, stricter, in their, their, in their, more defined in their, what they want out of you, whereas in the journal you can just write the fuck you want, pretty much.

A131 Agatha writes down what Jolene dictates in a small notebook. She will then

transfer these descriptive notes to the database in a more standardized and "nicer" language.

A132 **Zack:** Okay. That's good. I was hoping to find, like, I love seeing, like, how the system breaks down. You know, infrastructure right, this is information (....) so it's kind of disappointing that there's no problems.

Lauren: Well, I'm sorry. I, umm, in general, this is a character thing, but I don't like to break systems. I work within systems, and I adapt to them pretty quickly. And uhh, I just...

Zack: Yeah, I've seen that, definitely. You're definitely, always like, on the ball with data, with the recording, always at, very much, like, in line, with what the database thinks, which is great. Umm, so do, what, do you use any particular strategies to facilitate communication? With like, with these other groups, or is there, like, how does that ease, come about, how does that adaption happen?

Lauren: I don't know, for me it's natural. I've never been, like, a person to hold back anything, in a sense, so if I have questions I do not tend to hold back or overthink it, I just ask, even if they might be dumb or whatever. I don't really get that system, so umm, when I have questions I ask them and if I have problems I talk about them openly, because that's the only way that I don't mess things up, which I hate. So it was like, my ultimate fear of the first two weeks was just to completely mess everything up, because I have no idea what I'm doing, so I'm just open and asking people. Also, there's a slight language barrier, which I always have to, umm, acknowledge. It just won't... I'm just not able to, I'm not just on the same level as everyone else here, in terms of language, so I always have to ask about these things.

A133 **Lester:** I mean I want to integrate with the project as much as possible, so the infrastructure that's in place is the stuff that I would use, to interpret my data, so how the context sheets are laid out is how I record stuff. It may not be what I'm used to, so for example, the context sheets that we use here are entirely different than the ones we use in the field, because they're looking for different things, they're looking for differentiation between contexts that are very similar, we're looking for finding the thing in the first place, it's definitely more sediment description, very find detail. All of which is important, but not certain priorities that you'd have in commercial archaeology. I think it's important to use the infrastructure that they use here, not to rock the boat in that way, because it's, I think everyone interprets it differently on paper, even if

it's the same excavation material. So I'd say I think it's important to [unclear].

A134 **Zack:** And, I mean, it's also, like trying to teach, you know, some of the people in your trench. How do you think that has gone?

Lauren: I think it's going good. I really enjoy it, I have to say. Because it's something that I, sometimes I have to hold back on giving a ten minute lecture on my stratigraphy, because I just really thoroughly enjoy it, especially when they're interested. I like when they're asking questions. Umm, because of how the work is, umm, split, the afternoon work is split, they do not get as much of what I am doing in the afternoon. I am, I spend a day, I think, like, in the beginning of the week, like in the afternoon, just really, like showing them what I'm actually doing in the afternoon, what's the recording process, showing them my diary, because obviously they've seen it, but they have never really, like, done it. I mean, the first time I was a supervisor, I had no idea, like, what, what you have to do. And so, umm, yeah. I try to teach them, but it depends because not everyone here is going to be an archaeologist, not everyone is interested in learning these kinds of things. Which is totally fine, but umm, I find it important to engage with them.

A135 **Ben:** I don't think last year I, I don't, yeah I don't think last year I learned a lot about how to fill out context sheets or any of that type of thing, so like this year it was a bigger learning experience, like figuring out how to write in the journal and how to fill out the context sheets.

A136 **Zack:** Have you done any of the paperwork?

Ben: I've done very little paperwork. Lauren's taught me how to do it. Eve didn't teach me how to do it. I've helped with the, like the sampling, like determining what type of soil we had, and with the Munsell charts, you know, like the colours of the soil. But I haven't done any paperwork. I probably want to.

Jane: Didn't you help her like after? Like [might have been for] write-ups when we got back to the dig house.

Ben: Mmm, not really. She just, she was just showing us like how to do it and what to do. I helped her a little bit with the math, but...

Jane: Yeah.

A137 **Ben:** Yeah, it's all relative. So I knew, the only difference to me, I thought, was just gonna be like I have to worry about the trench more, I have to worry

about other people more, because I have to say like, oh are you taking your breaks, are you drinking enough water, blah blah blah blah blah. Or I have to teach them or whatever. And uhh paperwork.

A138 **Zack:** How are you trying to tweak it?

Theo: To suit me.

Zack: How do you do that?

Theo: Just get rid of the bullshit.

Zack: So what counts as bullshit?

Theo: Like sometimes you're just repeating yourself, and there's no point, so you just like, you would write in "see previous unit", stuff like that. And there's a lot of formulaic stuff. But if you're digging this ditch three contexts, do you really need to write that out thrice? And they say it's a thing, so I dunno.

A139 **Theo:** It's just, you've gotta have a simple enough form to fill out. You don't want to like a fuck ton of tick boxes, or just sort of, like all of the options in the world. You want to sort of, here's your block, it's the same whether it's a cut or a fill, here is your thing, so like...

A140 **Zack:** What about filling out forms. Like, just articulation of it and formalization? Do you consider that helpful, or a hinderance?

Ben: Hmm...

Zack: Or neither, or both?

Ben: I think, I think both. I don't know if I put enough effort into the articulation. Umm, again going back to Alfred's like soil like types and all that stuff, like I haven't really put in the time to actually like figure that stuff out. But I think maybe if I had I would be able to picture things better, but, I don't know, like...

Zack: You're doubtful?

Ben: Yeah, like I, I think it needs like, you need a lot of experience in it to like really be able to tell, Alfred would be able to tell...

Zack: To tell what?

Ben: Like, the type of soil, or like the very distinct differences, and like how many cobbles to pebbles and then like...

A141 **Ben:** Umm generally I have tried to be uniform in the way I write my journal and my context sheets. I think the context sheets have to be a little bit more, I don't th– like not bare-bones, but like less descriptive than the journal. So,

for example, like the sediment descriptions, just, it's gonna have like one word for each of the categories that Alfred wants. Uhh where in the journal I can provide more detail, and if people want to look back at it they can.

A142 **Zack:** Umm, when umm, when you're filling out paperwork, or doing data entry, or writing in your journal, or during the field the final field report, do you write them in different ways? I know, I have to ask these questions that I sort of know the answer to but– or, how do you, rather, how do you–

Theo: A journal is a stream of consciousness telling you where you're at and what you're doing in the trench and during the day. So some days it can be [unclear], other days when you're not actually doing very much it's just like half a page, a paragraph.

Zack: What do you mean by streams of consciousness? Just like what you're, writing what you're doing?

Theo: Yeah. And what you're thinking. So that you know, yeah, so that... It's because the idea of the journal is so that you can go back to it to understand what the excavator was thinking one [unclear] whilst they were excavating.

A143 **Theo:** If you try to make it clear, what's going on, but you don't always write, like, sensible shit in notebooks.

Zack: Would you consider–

Theo: The notebook isn't really something, it's a more informal way of writing stuff down anyway, so it's like stream of consciousness rather than a set method to do it. Like, you don't, yeah, so...

A144 **Zack:** Uhh do you document in the journal how you do the work, or reflection on how you–

Theo: I say how and why we're doing stuff. You've got to explain stuff, because when you're looking back at it you're trying to figure out why the fuck you've done something, you've got it written down and you're like "oh yeah, that's why I did it", so.

Zack: It's like a future reference then.

Theo: Yeah. Because it keeps you on top of what you're doing. Like, it helps you, yeah it helps you remember...

Zack: What about– oh...

Theo: dealing with so much stuff, if I'm running all over site everyday as well I forget things.

A145 **Zack:** Do you ever have problems getting back or remembering, and just trying to recollect what was going on when you're back in the dig house?

Ben: Yes. I think sometimes I do. I am, I am aware that I can forget a lot of things, so I try to, if there's something very important that I've seen while digging then I will write it down in the field. Uhh otherwise–

Zack: How do you write it down? In your journal?

Ben: Yeah, in the journal. So it will just be part of my notes. So if it's something that needs to get put down, I will step away and–

Zack: Have you learned from a mistake in that sense, or was it uhh, like a learning experience that prompted that development?

Ben: No, I don't think so. I think that would be a good way to learn, that way, but I think, from the beginning I knew, like I know myself and I know my memory isn't the best, and I'm not able to remember some details about certain things, so I know like, if I don't want to forget something I need to write it down right away.

A146 **Ben:** But looking– like I know Lauren was a good uhh recorder of information, so I've looked back at her trench reports and her uhh her notebook to see what she was recording and then, I guess I'm gonna try and and adapt some of her style.

A147 Came over with Theo, Maddie and Gwen present. Maddie set up level strings around the trench [...]

Theo asks Maddie to unfold long tape measure (referred to as tape). Then asks to get in, hops in. Unfurls rolled out tape measure, aligns it along north edge, top. They have selected the north section to draw.

One square on graph paper is 10cm in real life. I offer my clipboard.

"How deep is your trench?", [illegible] it to the string.

"What corner is that?" "Southeast corner."

"So that is your eastern section?" "Yep."

Refers to line on paper: "So this is your [stable] line."

"I always start from the top"

Every 10cm, the distance from the ground to the line level is measured.

Now they alternate. He holds the tape 10cm lower than before, dictates the distances to the line.

Actually, he holds it to the edge of the unit, not the next 10cm (my mistake).

Then Maddie connects the dots on her page, as per Nat's instructions. She does

a repeat line, like you would in a sketch, and he says "no, you want a solid line". Does this again for the next unit. Gets his scale ruler out to draw the boulder, which interrupts the section in the corner. I did not see how he used it, exactly. It looks like an unfilled portion, no texture at all. It has been labelled as "boulder", written inside.

Dot-dash line drawn to indicate "extrapolated" drawings, used to draw parts of the section where bedrock has been hit.

Then they do the base.

"It this bedrock?" "Yes."

"Then you can do as I did here"

Dot-dash line drew up to the boulder, as on the base at its edge.

Dot-dash line then drawn on the corner, to complete the "frame".

Asked her what she thought. To her, it is exactly what is there. She owes this to her being a visual person, is sure she can easily repeat by herself.

Theo then teaches the symbols, patterns used to represent materials, soils, sediment types.

He notes his own conventions as opposed to general convention, to draw pottery and other finds that stick out of the sides.

Also must draw in only the big rocks. After some discussion concerning what counts as such, Theo demonstrates which ones fit with his description or conventional ways to define such rocks, by pointing out which ones fit those criteria.

Another layer, just then drawn. It is "wedged" past the dot. Dangles under the boulder, since it is somewhat extrapolated. This is not a complete line, only sticks out of that vertical dot-dash under the boulder.

Then Theo offers the tape to Gwen, who tells the measurements at the line. Theo places his hand at the base to support the tape, since she is slightly unsteady, and she can not bend over to look at how the bottom aligns with the layer's edge. Theo also uses this to control where the edge is defined.

Now they're drawing the rocks. First is actually a negative impression, where a rock presumably fell out. Theo says to typically draw three points. However in this case he suggests four to be sure. He then says to just 'eye in' the shape of the lines that connect them.

She does so, then indicates that her lines are less well-defined than before, in a hesitant tone.

Theo procures a pencil sharpener, and sharpens it himself. He is very careful, after some big twists, does a few smaller twists, pulling it out and inspecting

the tip each time.

Jess now measuring points on rocks on her own.

Theo says that you can use any number of points, depends on how comfortable you are, and depends on the rock, but he prefers to use less points and then "draw it all in" by eye.

After he packs his bag to go back, she traces over her solid lines, defines them more strongly using her sharpened pencil. Theo offered to come back in an hour, but Maddie insists it will take less than that. Theo agrees.

A148 Typical script:

"At x on the horizon, it's y down"

Followed by an acknowledgement.

Sometimes a novice asks "from what?", or "from the east end?", or "from the line?", but once it is clarified that the reference point remains fixed, then they instantly understand how the whole system works. It is all about two people, working in tandem, with a commonly understood system of communication that goes along a shared reference point. I noticed such an "ah-ha!" Moment when Theo was teaching Morris how to do this.

We then went to [redacted trench ID], where I went down to bring some equipment down the hill, while Theo and Jane started in [redacted trench ID]. Jane is doing measurements, while Theo plots the points.

Jane seems very comfortable in her trench, much more than Alice yesterday.

Theo is able to communicate with her, ask her questions. She also refers to her sediment description on her contexts sheets so that Theo can articulate [?] them more appropriately. He asked whether what they just did was the hearth and she said "no, it's the black-brown stuff above the hearth". He then wrote something like that down on his drawing. He also showed her the connected dots and asked her "does it look something like that?" And she answered that it does.

Some other common lines:

"Does it go up/down left of that rock?"

Basically a series of relations among entities, which are described in terms of actions that they take.

They "hit the section", "rise/fall", "plateau", "flatten out", etc. In any case, the activity of the delineations is energized. Really, the focus is on the line, or the interface. The interface moves in relation to the reference points, that

is. Moreover, it is accepted that such activity is unclear or blurry, and that extreme precision is pointless.

A149 I will now observe Theo and Alice draw the sections for trench [redacted trench ID]. No one else is here, and Theo expressed some confusion regarding what is going on in this trench. Moreover, Basil can not find the paperwork for [redacted trench ID], he is on top of the hill at either [redacted trench ID] or [redacted trench ID], and Jane is resting back at the dig house. So it should be interesting to see how Theo's drawing pans out with Basil's expectations.

He is currently setting up the [illegible word], string and line levels. It is extremely windy, so it is a bit of a challenge. As before, the string and tape measure are clipped to the rebar that are staked into the ground at the corners. The line is on the south section. Because of the slope, much of the line is higher than the ground and this causes the wind to shake it all over the place.

Alice on the big boulder in the southeast corner. Theo on the north side, with graph paper, taped down to his clipboard with bandaids. Alice calls out numbers to him as he asks them down. They called for my help for a moment because it was too deep for Alice. Upon hearing the elevation of the base at 1.5m along the edge, Theo [illegible word] and said it is [illegible word] too deep, and that he would need another sheet of paper. This wind is going to make that horrendously difficult. So they reprioritized, and limited their scope to the upper part that would fit on the page.

I was interrupted, since my assistance was needed. I had to hold the tape [illegible words] numbers to Theo. It was also challenging since no one who actually knows the material was actually present to interpret the stratigraphy. Basil then came by, acknowledged that this would not be very effective due to the wind and unfamiliarity with the trench, and instead Theo, Alice and I spent the rest of the day lugging equipment down the hill.

A150 I asked Lauren about the placement of her line and tape measure, and she told me that it is not due to the present circumstances - she picked that up from her first excavation, and has been doing drawing in such a way ever since. There are several practicalities involved. First, she finds it beneficial to measure both upward and downward relative to the line. This is particularly useful in deep trenches. The line is placed in an arbitrary position, where there are few rocks at the corner, so that nails can be hammered in easily. After one section is drawn, she can then remove one of the nails, pivot the string around so it is on

the other face of the pivot corner, and secure it easily there. Then she must check the level on the line, before proceeding with her measurements. She notes that setting up the string is definitely the most time consuming, or effortful, part of drawing.

This seems to have several advantages over Theo's way of doing things, in terms of relative ease. There was definitely a lot of effort put into securing the line, making sure it is taught, etc, since he relies on shaky rebars, strings tied down with rocks, and an above-surface line that blows in the wind or is at risk of being tripped over. However, he uses the local datum as the reference point, and does not have to measure the depth of the line. This additional set of numbers and calculations might be an impetus for his aversion to Lauren's method, but I have not asked him about it yet.

A151 **Ben:** Oh, okay. To Basil, and I guess as the, to the project as a whole, we want, in my trench, to find Levallois technology or whatever, uhh cores, with Levallois characteristics.

Zack: Is that a goal that is in your mind?

Ben: Sorry?

Zack: Is that goal in your mind often?

Ben: No, well, I don't–

Zack: Sorry, I interrupted, sorry. That's what happens when I drink, I talk too much.

Ben: Hahaha, okay umm. I guess subconsciously it would be in my mind. I don't think I'm actively being like, oh, that's a Levallois core, let me pick that out. Like, regardless of if it's Levallois or not, it's gonna be picked up and put in the bag. Umm, by extension, we want to find Levallois stuff, or I don't even know what kind of Upper Palaeolithic or whatever, I don't know, I'm not good with those ages. But uhh, we want to find that without, like, ruining the dating by finding pottery or obsidian or something else. So uhh, I guess the role of my trench is to find this, find this stuff, without finding the other stuff that is gonna like ruin the dates for Basil.

A152 **Zack:** Do you, like, so, what, is there something specifically that really piqued your interest? Like, not necessarily like lithics, but like, or like working in the field, but like something really specific that really, like you want to continue? Or no? And that's fine if you don't. But is there anything that... what's the most exciting thing to you, if there is anything like that?

Jane: Uhh like, I'm sorry, in [the project], you mean?

Zack: Yeah, or like things that you want to take with you.

Jane: Umm. Well I've liked, I think one of the coolest things about working on this project is the people that like come in and out. Like, I didn't really know that like Alfred's kind of job is like so close to the [.] of archaeology. Or like meeting umm Richard, who has like Neanderthal seafaring. It's kind of like, almost like a consistent conference for archaeologists. Like we don't really have like the same business opportunities that they [...], so I've like that part. I liked, I like Neanderthals, because it's kind of like the gateway for me to, and then I get to meet those other people, so that was, that's been exciting for me, I like doing that.

Zack: Yeah.

Jane: And like having the association with Basil. So now I can say like, I don't know if you remember me, but I was working with Basil Basil, like that kind of thing is important.

Zack: Yeah, it's very important.

Jane: Yeah.

Ben: I came into this, less thinking about like my future career in anthro, and more like developing myself, so it's...

A153 **Lester:** It's the first time I've worked with geoarchaeology as well, which is really exciting.

Zack: Yeah, you seem very interested in that.

Lester: Yeah, it's not a methodology that's practiced a lot in the UK, so it's nice to see that being used in this setting.

A154 Sam came in to smash the big boulder. He asked, jokingly, if it has a name, and surely enough it is named Matilda. This is a common practice that eases the sociality, but also serves the practical purpose of being able to identify particular objects out of many potential candidates, i.e. rather than referring to "that big rock over there" and receiving a reply "which one?" with a chuckle. Also facilitates problem solving or strategizing back at the dighouse, discussion on how to proceed.

Usually relatively long-lasting objects or obstructions are named. When they are removed they are "dead" or "killed". A mini mournful comment is sometimes made, maybe to provide a sense of closure perhaps?

A155 Finally asked him about his selection of rocks to draw first. He always draws biggest first, since the smaller ones can be more easily drawn around them.

Interesting that a reference point is needed for the smaller ones, but not the bigger ones.

Asked him about this after he got back from the bathroom. With smaller ones, he's just "guestimating". "I mean, you could spend hours measuring them in, but you know, that would take hours"

Sacrifice of time and effort and comfort. He is in a position to make such decisions and there seems to be a threshold of quality, as which point such minutia do not matter. He recognizes this, and it has come up in our prior discussions while doing data entry for him.

He is meticulous, but also gets a bit fed up in the sun sometimes.

Anyway, the purpose according to him is to document the distinct units, not the rocks within them. Certain large rocks are selected because they frame the context.

According to Theo, "they're important".

A156 At around 7:55 Will asks me to put a little nodule in the soil sample bag. I may ask him about that later.

A157 Without cleaning, and perhaps just to see whether it is worth her time, or to check if the deepest spot she reached is adequate, she measures another elevation; she can then go down to that point knowing that it works.

Actually, it was to measure the depth of a large handaxe-looking thing. She noted it earlier but I guess she waited till her legs got sore to take an elevation. I may ask later.

She did not use the term x find. She is unfamiliar with handaxes, [illegible] particular a preform, but apparently Basil got excited about one on the other side yesterday, and because she's a newbie she decided to record it just in case.

A few minutes later Olivia uncovered a large phallus shaped stone, similar in size to the large handaxe, and we all joked around about it.

Nina at the sieve, brought over an orangey-brown piece of chert, no cortex, for Olivia to examine more closely. "If it weren't this colour, it might be shitty material. I would chuck it. But so [illegible] heat treatment caused darkening colour so this might be that."

A158 Moved to watch Agatha now. She pulls a pile from the larger pile made by Jo-

lene. Separates cultural material from natural material to throw away. Cultural material is out in a pile in the back, natural is kept where it is, directly in front of her. Once the pile in front of her has no cultural material in it anymore, she separates the natural to the side and clicks her clicker according to how many are moved. Then she sweeps these off the table, into the zimble on the floor. Or, to be quicker, she clicks as she drags them into the zimble, or as she drops them in after grabbing a handful of small material. This number will then be subtracted from the total count, which was mistakenly recorded earlier without removing the natural materials.

A159 Today I stayed back at the dig house to do flotation, along with Zoe and Laurence. Although Zoe had done it earlier this season, she had never done it on her own, and I was very rusty. The three of us had a great time re-learning how to operate the flotation device on our own, which included making some non-serious mistakes and laughing our way throughout the day.

Though the mechanical system of the flotation device is relatively easy to comprehend, I was still kind of wary to operate the machine, especially when others were not present, and this hesitation subsided over time, once I gained a familiarity with the mundane and repetitive nature of the work. I think that the others feel the same way.

The sociality of flotation is noteworthy. It might be described as team-building. Individuals are assigned roles based on their preferences or affinities. So label making was Lareuce's domain due to his attention to detail and extremely legible handwriting. Zoe is very gung-ho about getting dirty so she cleaned out the tank. I collected and sorted soil samples before and after flotation. This was largely unspoken. It was socially negotiated. I would like to investigate this in more detail later on, though I will likely not be able to to film it due to the very personal nature of the conversations shared around the "cauldron". Instead, perhaps after doing flotation some more with the group of people who usually do it, I will be able to sit in the corner and observe, taking notes of conversations and interactions with broad brush strokes.

A160 Agatha does a lot of busy work. She brings material back and forth from storage, for Iona to count and weigh, and for Ana to analyze. She also prepares level 1 recording sheets where counts/weights can be written down officially. Also compiles the list of already closed contexts, numbers of bags within, etc. Planning work for [illegible].

A161 Jolene describing laid out materials. Somewhat of a performance. Starts with a big core from Lauren's trench. It stands alone. Tosses is around, across her hands, but looks at Agatha, who takes dictated notes, as she speaks. Speaks a few words at a time, [illegible] so that each four words are enunciated for Agatha.

Concludes by "and that's it" before adding a last minute additional note. Then adds "and that's enough".

Onto [redacted context ID], laid out already. Looks down at the table, scans the material. Does not touch yet. Generalized descriptions. Most, many, boolean logic, etc. Describes a few particular objects in more details. Hones down into more specific groups of finds, describes tendencies among them.

Still very descriptive. Stating how many of what. Defining the scope of the assemblage. Not yet uttered anything about periods, etc [illegible]. After describing patina, however, she begins to add some interpretations of deposition conditions. Then notes burned pieces. Now explicitly notes "concerning dating of material..."

Notes caveat first, conditional clause proceeding what her observations are pertaining to a subset of the material, very cautious and selective with her words, and does not backtrack or correct herself.

Then explicitly introduces her notes on the emery.

Then moves to the side, has closer look at the smaller finds. Physically handles a few.

Lydia asks to put them back in the bag. Jolene says sure, but goes through them, selecting a few to bag separately, for [illegible] to go through later for a second, more specific look.

Lydia's question to pack up was a welcomed interruption. Jolene was a bit fed up with this context, since it has been on the table for a very long time and she was glad to see it settled.

Agatha writes down what Jolene dictates in a small notebook. She will then transfer these descriptive notes to the database in a more standardized and "nicer" language.

Now for [redacted context ID]. Starts with material selection. Most to least. Notes mixed material, based on partial and "[illegible] typological [illegible]", does not specify yet.

Now describes Mesolithic. Describes most abundant [illegible] of lithics. "As well as one multidirectional core", it stands out as exceptional.

"Second group would be Upper Pal tools and blades in similar preservation". Then goes on to describe subgroups within it. "This assemblage is defined by..." Then moves on to Lower Pal, as well. Grouping emphasizes patination, since this is important for discerning Lower Pal material.

A162 She actually really hates these organizational tasks. She is really grateful for having Agatha as her assistant, who could do all of that, which she generalizes and dismisses as of somewhat lesser importance, or as the distractions from her more hands on work.

A163 It is extremely difficult to share how good I feel about this code. It represents a major breakthrough in my learning how to use R, and it sucks that no tangible research products can come out of this in a way that shows my skills. I actually included an R script on my [funding] application that was due on Friday, as a non-refereed contribution, but that designation is sketchy.

This seems to be true of database work in general. I will likely not be published on major papers as a co-author because my work is 'supportive' but not necessarily "creative". The output of database work is other people's work. But the product, the database itself, is a creative output. It's the result of a tremendous amount of unpaid work, highly skilled work at that. However, there are no ways to recognize or evaluate these skills. At least not in a formal or bureaucratic way. Perhaps this is why there is so much gatekeeping and nerd-signaling among "digital archaeologists", it's a way to indicate that one's in the know. But I don't believe that that is a reliable indicator of skill or know-how, it's easy to play the game on twitter, it takes lots of time, over the long term, to develop digital skills.

A164 **Jamie:** There's the coding part and then there's also, like, dealing with the information in the database itself. So that's a lot of getting spreadsheets from people, compiling it, formatting it properly and then putting that into the database, cleaning it up to make sure it's all the same format, and consistent, yeah.

A165 Yesterday (Monday) I spent most of my day writing an R script to import lithics data into the database from the series of spreadsheets that Basil and Jolene were using to record data towards the end of the season. I'm very proud of this script, it is several thousand lines of code, albeit most of it is modified copy and paste, but that aspect of it is built into its design. It's designed with

uncertainty and inconsistency in mind. Always in my mind is the question: How am I going to explain this to Isabelle on Friday? I'm going to McMaster to show her how to operate this script since she was initially hired as an RA to do data entry.

This would comprise copying data from the spreadsheets to the database, cell by cell. Not only is this completely mind-numbing and tedious, but it increases the chances of errors to be made, and it is expensive to hire an RA to do all that work for hours on end.

A166 **Zack:** with regards to the presentation of the data itself, how do you anticipate you might present that data when asked for it?

Basil: Umm, I think–

Zack: Because I think it will be asked for.

Basil: Yeah. I think, I think the greatest clarity will probably come uhh, as much as I understand these things, comes from the dating lab. Umm they have produced a great deal of text, probably the bulk of the main text, certainly the bulk of the references, probably like sixty or seventy out of a hundred references pertain to their work. A very detailed description of the methods, the protocols, they probably have something like ten of the figures and tables combined, they have the bulk of those, so I think that, I get the impression, and again I don't really, you know, [it's not terribly clear to me], that an external reader who is interested in this area will go a-ha, I pretty have everything I need to add. There might be a couple of follow up emails. Whereas if people waned to use the lithic data, there is a relatively detailed but broad stroke representation of what we have. There is quantification. Umm we give exact numbers of artefacts per lithostratigraphic unit, but in terms of breaking those assemblages down into how many flakes, how many this, how many whatever, that's not available. If people do indeed feel a need for that information, and they email me, I will probably turn around to your support, your good self and Gabe in terms of, rather than sending them a hundred excel files, how do I give this to people in a useable way.

A167 **Zack:** Based on your experience, what are the main obstacles for effective use of such pervasive tools in archaeological work? And what are the main positive factors or drivers that can make the prospect more tangible in spite of these challenges?

Jamie: Umm, obstacles. So, as I mentioned, lack of digital literacy, statistical

literacy. Umm another big one is just the fact that on a complicated project like this one, or just like any kind of real work field study, it's not gonna be ideal for data collection. Like people are gonna record things differently, or improperly, and it's gonna have little, kind of uhh, and it's a long term study like this one, things are going to change over time and it's going to be inconsistent. So in that sense, fieldwork, or field data is never going to be ideal, perfect, clean for data management and data analysis. But umm, ways to get around that, I think, are implementing, as early as possible, or, you know, as consistently as possible, some kind of standard. So like, we have the entry form, so it's telling them, like, what to say, where to say. We have the drop down menus so they, they're not just going to write something random, they're gonna have a controlled, kind of vocab, and that makes it easier, I think, for everyone to interact with these digital tools, if it's been laid out for them.

Zack: Sort of like prompts.

Jamie: Yeah exactly. So it's not just here's an open ended thing, write a page. It's like fill in this specific information in this way.

Zack: Why is that necessary?

Jamie: I mean, just in terms of collecting useable information, right. If someone, like I know when I want to analyze data, it has to be the same time. So something as trivial as like capitalization, or if someone writes a sentence on something and someone else is reporting it as like initials, you know, it needs to be in the same format so you can actually work with it.

Zack: It's a certain understanding and way of working that–

Jamie: Exactly.

Zack: Would you say that this overcomes a certain disconnect?

Jamie: Yeah, it's tough, because like, ultimately, the data analysis that we're doing is, it's for the archaeology. They're not doing archaeology for, you know, data purposes. But I think ideally they would be a little bit more connected, and stuff could be recorded, like keeping data in mind, and keeping the fact that you have to work with this stuff later, in mind.

A168 Ben: Because at the very beginning I would only write in my own notebook and then transfer al the information. But now I tend to start at least writing down my context sheets in the field. I haven't noticed a difference in terms of the turnout. For me it's basically the same. It's just I'm getting more comfortable with filling them out so I do not have the feeling like I have to sit down, be able

to think and to ask people stuff.

A169 **Zack:** So what kind of, how engaged are you with fieldworkers or specialists or people who give you data, and can you describe a little more about that, kind of, relationship with, like, getting the data in and making sure it's, or like, fixing these problems?

Jamie: I mean, reasonably engaged, I would say. Umm, obviously there's like a time delay on a lot of stuff, because we process at multiple levels, and they're giving us information at different times at different stages of completeness, so in that sense there's a little bit of a disconnect. But umm, it could be more engaged, I would say. But...

Zack: In what way?

Jamie: Umm, it's kind of a broader, like workflow thing. If it just, kind of, you know, because of the long delays, like it takes, we'll get a spreadsheet of something that they analyzed so long ago, and then if we have an issue

Zack: Ah, I see what you mean.

Jamie: Then they need to go back and check that, and it's kind of complex in that way. I don't know how it could be avoided really, but...

A170 **Zack:** Do you think that the introduction of uhh, of digital tools and technologies, and, you know, the fact that they're becoming more pervasive, is changing the roles of those involved in archaeological work, and if so, how?

Jamie: I think it's, in our case, creating new roles. There probably wouldn't have been database people on a project like this 30 years ago. I think it's changing roles in the sense that, even when there are, like, assigned people to deal with this stuff, the other archaeologists still need to be able to, you know, understand it to some degree, and keep that in mind, I guess, as they're doing their work. So, they need to be at least aware of it on the periphery, I guess.

A171 Today I'm observing in the apothiki. We all just got back from the site tour, which included everyone, including people who do not usually go to site, going around to the excavated trenches where supervisors describe what they have uncovered and the progression of their work.

I've noticed that after each narration made by the excavators, Basil then makes a rebuttal that contextualizes the work that has been done within the broader field of research. He refers to the geoarchaeological implications of the things that are here and now, which are described by the excavators rather plainly, and

in relation to their own experiences with it. The immediacy of these remembered and narrated interactions is often told and perceived with humour. Things like: "and then we hit this big boulder", or "then we lovingly excavated through this red clay bullshit".

Last night, in an email titled "notes for site tour / lithics assemblages / level 1 database", Basil emailed all the trench supervisors, and cc'd me, Jolene, Gabe and Alfred, with brief notes of the lithic assemblages from the lower strata of each trench. I perceive this to be complementary to the site tour, from the perspective of the apothiki, which might also support or inform the work going on in the field. However, I did not notice anyone specifically referring to these notes as a document that they reviewed and rely upon, but I did not have a chance to read it myself so they might have made reference to its contents without explicit acknowledgement.

Basil, in his rebuttals, would make some references to the kinds of finds, in particular the quality of the lithics themselves (worn-ness, weathered, age, etc). Jolene largely remained silent.

A172 **Basil:** Yeah. I mean, it's the sort of thing that I probably would, if I had umm visit— I can't remember if I had said this. But if I'd thought about it, I probably would have said: guys, if we ever have visitors on, no music. Take your headphones off—

Zack: Oh yes. I think everyone adhered to that.

Basil: Yeah, because, it's like—

Zack: There was one point where there was one song with a lot of profanity, and it was right before Denise was arriving.

Basil: Yeah. It's just like, umm. So I think I need to let people know next year, in terms of like it's the policy. If you feel like you will benefit from having music, do so, but if somebody in your group, it would be distracted from their work in doing it, you're not to have music, and absolutely not when we have visitors. Because I think it's one of those things, like, umm, Morris went shirtless a couple of times. I remember back in the day when I was working in [re-excavations], most of the guys would be shirtless. And nobody did this year. And when he did it a couple times, it kind of was a bit jarring, and again it was one of those things of like, guys if we have visitors put your shirt back on. And I remember right towards the end, when it was blazingly hot, umm Talia came and had a quiet word with me and said like, the guys are really suffering, is it alright if

we just wear, just for the last half hour or whatever, if we just stripped down to our sports bras? And I was like yeah absolutely, it didn't bother me in the slightest. But they were, they were really nervous about, because I think there's issues of professionalization, whether it would be offensive or whatever, and I said, you know, of course, if we have visitors... and everybody was like yeah, yeah, yeah, yeah, absolutely, absolutely. But it was like, you know, it wasn't offensive, umm and it makes them—

A173 Zack: Any other kinds of documentation or supporting figures that are notable?

Basil: Umm, I mean, we, for the main paper you are allowed four figures and/or tables, which is relatively restricted. So one of the things we did was it kind of forced us to produce a few sort of like, comp– uhh coalesced images, so you sort of cheat whereby you stitch together in Photoshop a, b, c, d, which, you know, might originally have been figures one through four in another venue. Umm, with the supplementary online materials you're allowed another ten or so. So, again, there's, working with this venue has, you know, forced us to be really succinct, both in terms of visual and data presentations. We have one table in the main thing and three images, and then a lot more images and data, primarily pertaining to the dating technique, in the supplementary online materials, along with some umm supplementary uhh technical drawings of artefacts to satisfy other audiences.

Zack: Who has prepared all this stuff?

Basil: Uhh a number of us. The, the author list I think is about seven or eight of us. Umm. The main umm map and site plan and stratigraphic reconstruction was undertaken by Alfred, our geoarchaeologist. Umm one of the tables was made by Gabe. Uhh the artefacts were chosen by Jolene, umm and were photographed by uhh our old photographer Laurence, but then were reworked by a palaeolithic archaeologist who works closely with a photographer from Jared, so I paid him specifically to page set in a way that made aesthetic and scientific sense. Umm and then uhh our three French colleagues did most of the uhh supplementary umm data plots for the dating technique. And then by colleague Jolene did the technical drawings.

Zack: And what was your involvement?

Basil: Umm, the writing of the main text, the, you know, basically the creation of the narrative. You know, I was the one who sort of initiated, like, this

is where I think the story should go, this is where I think the interpretation umm, all the interpretation, the main big picture interpretation comes out of it. Umm there was a bit of background, you know, very curtailed, which was quite nice. You know, background of the project. And then, sort of, the big chunks in terms of like the sediments and the interpretation, Alfred took over that. But, I mean, ultimately there was probably about four of us who, you know, worked, sending the text between us by the end. So there was a number of key scholars involved, but in terms of the production of the dialogue, or the narrative arc, umm and the interpretations and sometimes the haha reigning in of my interpretations, was between myself, Gabe, Alfred and Marie from [redacted].

A174 Zack: That's interesting. Umm, what umm, how are these uhh, these supporting data, figures, maps, et cetera, uhh being uhh documented or supported through more explicit, like descriptions of methodology or things like that? Or is it very much uhh subtext, that everyone short of see, you know, academics, they can sort of understand these sorts of things, right?

Basil: Well, within the, you know, the main, the main text of the 8000 words is crafted to be as accessible as possible. So every main, obviously every, the three main figures and the table, they are all referenced to, so there is a caption for each figure and table that gives the most simplistic explanation of what they are. Umm but then, you know to an extent, we double down in the supplementary online materials where we go into much more detail, in terms of like, okay here's the really long winded, multi faceted version, that certain people might need to know, umm, that underpins that one sentence long version of the caption. So here's, you know, that embodies this kind of detailed information. You don't necessarily need to know that detailed information in the main narrative, for the sake of the narrative flow and uhh, and also that may just not be terribly pertinent for you.

A175 Basil: I think, I think, again it's, what's been quite useful with writing for this journal, is again, a) it demands a decent narrative, and b) it demands a clarity in it. Now, one of the things we also appreciated was a potential academic pushback should we try to oversell our story. So I think by the end, I think we've matured over the years, and I think I've matured, umm in terms of some of what we said publicly at conferences and some of what we hinted at in publications was a bit more sot of rattling the cage in terms of what we thought

we could say. I think we now, we appreciate that we have a very important site, and we're filling certain gaps of knowledge, without having to oversell the story. And so, what we basically argued is that we have people here a lot longer than we had previously thought people were in this area, and that while we are not necessarily ruling out pre-homo sapien seafaring, we are taking a more cautious line whereby we believe that perhaps the most sensible conclusion is that umm hominins were coming to [this site] during those periods where the sea was sufficiently low to expose a land bridge from [one region] and/or [another region]. We, you know, one of the reviewers actually asked us to like not completely throw the seafaring umm narrative under the bus, and so, you know, we emphasized that we're really not, maybe down the line we might be able to show this, but as it currently stands due to the difficulty of our material or being the secondary context terminus ante quem, we can't be et cetera, et cetera, and, you know, again, within the main narrative and the summation we re-emphasized that, given the nature of the site, secondary deposition, all the dates are terminus ante quem, we really have an unknown, this is what we can say and this is what we can't say. So I think we've been quite critically reflective about what we have and what we don't have, or what we can say and what categorically can't say at the moment, and hopefully that will permeate to the reader who will then go, ahh yeah, this isn't just another cave site where you can extrapolate dates across, this is a bit of a weird bunny.

A176 **Basil:** And so, there is a, you know, there is a certain trepidation, there is an inching forward, there's a lot of, well do you think this is this, or do you think it's that? And it's like, at the end of the day, it's like, we can look at the books, but there comes a point where there's a level of confidence has to make a call, in terms of, are going to call it this?

A177 **Zack:** And umm, you've done lithics analysis for other projects, and you've excavated before. How is this–

Basil: Yeah, I've been doing lithics analysis umm as a publishing member of the team since 89 in Greece, and I've participated in a number of excavations mainly in the UK, umm cultural resource management type excavations but I have also excavated at umm [redacted] and in [redacted].

A178 **Zack:** Have you ever seen that happening, looking back at old field reports, or anything like that?

Theo: No, I don't really care to look through old field reports.

Zack: You just trust your instinct?

Theo: Yeah. I think, but what do you mean? What sort of old field reports?

Zack: I'm just, I'm thinking when, I'm thinking about when you're looking back at things like from the 60s, I've read some reports of like statistical analyses where they're just using things that would not fly today, because they just, the number of pot shards from something and something doesn't really matter today.

Theo: Yeah, I suppose. There's, there are occasions, but I don't really tend to read them much. That's more of a thing that you're doing when you're studying, but I'm just working. Sometimes I read stuff, yeah. I've never noticed anything. It's not really the sort of thing I look out for. I'm more interested in what they found.

A179 **Zack:** Yeah. So how does this publication differ from other similar kinds of research outputs, such as reports to the Ephoria or like internal trench reports and whatnot?

Basil: Most of the other umm reports have been fairly general. They're not written for lay audiences, but they're sort of annual reports. They usually start with a reminder of why we're there in the first place, our research aims, a little precis of previous research, both our own or others, and then ta-da, this is what we found. Umm so they're little sort of chronological slices of our activity. Umm what this was gonna be was something synthetic, with a, because of the journals we were aiming for we were quite limited in our words, which meant immediately we didn't go through that performative this is what happened before us, and this is why we're here. It was pretty much straight into this is what we've had, umm this is how we analyzed it, umm and this is the big picture significance. And we also felt very strongly that these data lent themselves to a very wide audience.

A180 **Zack:** Yeah, so it's practical. Uhh but in your view, does the digital technology– sorry, in your view uhh how does the use of digital technology effect the way archaeologists work, and work together.

Basil: Umm, I mean just writing this article. You know, once upon a time you probably all have to sit in a room and talk about it. Umm, virtually, you know, we have, I think the vast majority of the discussion about the production of this article and its actual production happen at distance from one another. You

know, we were, you know, in five, six different countries, two different continents. Everything was done by, you know, electronic communication, editing was done through track changes, you know, Dropbox this, umm, you know, we didn't even use Skype or anything. So I mean, digital technology was fundamental to the production of this work. Umm, you know, the, I mean, the data sharing, you know, basically umm, I can't remember how Gabe got hold of all of it, whether we just gave him all our excel sheets and he pulled it together, umm, but you know, we weren't, you know, I'm not a huge fan of Google Docs, so it was an individual document that would go around, and was like okay, Gabe's given his view, now off to you Alfred, now off to you Marie, and then everybody gets another final bite and we'll sign off on it. So, there was recurrent information flow without being centralized. Similarly, there was data flow without being centralized. Umm, yeah, like you said, I guess I'd be freaked out with Google Docs–

A181 **Zack:** Great. Umm. I mean, it's hard to anticipate how this Lester, how these things, you know, the publication and the data behind will be accessed or used by others, but how do you think, like whether your thoughts on its usefulness, or its general use by others after it's published?

Basil: I think, umm, what if–

Zack: And perception, in general. Sorry.

Basil: I think, umm, I know for example, that there are scholars, such as [redacted], who's in [redacted] or [redacted], has a database of radiocarbon dates from Palaeolithic Europe. So there may well be scholars out there who will want to glean umm our OSL dates and put it into a larger umm database pertaining to Palaeolithic chronologies.

Zack: Sort of like what I did with the obsidian.

Basil: Yeah. So I can, and I would like to think that the way we had presented it will enable people to do exactly that. Umm there may well be other people out there who are interested in making a comparison between their site and our site in a broadly similar area or period or what have you. As it currently stands, I don't, we haven't in this paper presented, provided all the numbers that would allow a kind of a, an assemblage structural comparison between our site and somebody else's site. However, with this promise, if somebody emailed us and said I would like to know this then we could provide it for them.

A182 **Zack:** Okay. Yeah. So there was no one asking for data, for other data or

anything like that, that weren't in the supplementary materials?

Basil: No, not yet.

Zack: Were people besides that one person asking for methodological details? Or documentation of how things were done or recorded.

Basil: No. Everybody seems to have taken it as, I mean, it was fairly detailed, clear umm. You know, a ton of material in the supplementary materials. I mean, it's very rare that I've been asked anything like that before. I remember from years ago somebody reaching out to me from [redacted], saying, oh, we're putting together a database on early obsidian use. Can you give us all your data? And I was like uhh no. You know, if it had been, if it had been like, can you give me the data that underpins this paper, then that was different. But they were basically asking for all the unpublished stuff. So it's, I've not found that to be a terribly common phenomena in any way. So the fact people weren't asking for data for this paper kind of fits the pattern.

A183 **Jane:** Approaching another context, I think.

Zack: Why do you think that?

Jane: The texture is changing, and the colour is changing a bit, and umm, there's a layer of big boulders and now there isn't.

Zack: Can you be more specific?

Jane: Well the darker sand is becoming more red, which is similar to what we had there, and then I also noticed that is holds more of a form, like the hearth is very loose, but the sand is more in place, it's almost like if you brushed it, you would get a perfect floor.

A184 **Jane:** So, this is like still kind of a dark, dark brown, going into the sand, but it's like really tough, like hard to dig through, kind of. So I think maybe it's just context [?]. ((gesturing towards other side of the trench)) And then this is like really light grey, ((bobs hand up and down to emphasize these last three words)) and I thought it was just cuz it had just dried out, and I hadn't done this kind of [fill], but it's also really hard to dig, and like a really light grey, so I don't know if it's just remnants of this part, or what...

((Basil gets in the trench to take a closer look))

Jane: Or like maybe this is like, would it be possible that that's like an older hearth, like the other one that was leached out?

Basil: Yeah, hmm. So the colour here is the same as what you were digging, but the consistency has changed?

Jane: Yeah

Basil: I would clean up, maybe just straighten that section a bit

Jane: Yeah

Basil: Just to the depth that you started at for this context

Jane: Yeah

Basil: And then we'll clean up and carry on with, you know, we can just write in the text that, you know, these are the differences

Jane: Yeah

Basil: But you know what, after we start to dig it it might change back to something more familiar

Jane: Yeah

Basil: And we can just say oh, it's like some kind of differential lens of material within it

Jane: Right

Jane: Okay. Okay, so just clean up the walls, and then keep going, okay.

Basil: Yeah, but we can photograph, change numbers.

Jane: Oh, okay.

Basil: We'll treat it as something different, you know we can write in the notes that there is a very good chance that it's still the same stuff, but the consistency changed

Jane: Right.

Basil: So, just be careful.

Case B

B1 **Zack:** Yeah. One thing I've also noticed, as someone who does database work, a lot of these technical aspects are hard to claim authorship for.

Rufus: Sure.

Zack: I've had this experience recently where I was a little bit peeved about having done so much work, not having been credited in a publication. I'm wondering if that's something that you see as potentially changing in the field.

Rufus: Maybe I guess from the director... I was in your exact position, I was running databases and GIS and everything, but I was always given the opportunity to, if I wanted it, to publish stuff, always. So with the photo– the JFA article and all those other articles, I was given the opportunity to do that, provided that I took an active role in that. For for PKAP, example,

yeah, any report or report [unclear] our department of antiquities publications or whatever, as a trench supervisor student, I was never put on reports. I was never put on those publications. Once it became field director, which is obviously under co-director, I was. And I was given opportunities to take, to be a lead on these things. I understood that from their perspective that they are bringing over people like trench supervisors, bringing them over, paying their way, room and board, all that stuff, and they had a specific task to do. When they did that task, that information is then absorbed into the project. If they went above and beyond or wanted to take an active role in something, there was opportunities to do that.

Zack: Specifically regarding that, so I I've been trying to find ways of like representing my work, like digital work, which is often like very specific to a specific locus or specific context of work, right. So how did, like it's like, so how do you share this, this collation of data, [unclear] learned a lot, you know these skills that other people don't have, you share that information, that's the sort of thing that I've been struggling with. As these sorts of things become more pervasive, how do you think these are going to be handled?

Rufus: Yeah, I don't know.

Zack: That's a strange question, I haven't really thought through that.

Rufus: Yeah. And I don't know how they would change necessarily. Because on a project director side, this is a 365 day a year deal where you're always writing grants or writing publications, thinking about the project, game planning for next season, getting resources together. And there's a tremendous investment in that. Versus, say, a trench supervisor that's rolling in for three weeks writing the report and then handing it in. That level of contribution wouldn't necessarily equate to an authorship on a peer reviewed publication. And granted, I was that person–

Zack: I'm not trying to pass judgement, I'm just trying to get your perspective.

Rufus: And that would be my perspective I guess. Yeah. If a graduate student or the, I don't really see undergraduates in that particular position. But if that trench supervisor is like, hey, if it, in my instance, if I had somebody come up to me who was a trench supervisor and say, you know, I'm really interested in this thing, I would foster that interest. They could take that on. And that's something that we can authorship on give an the publication. For the creation of a report, no, because what the person is putting in that report is discussions that I had with them. Umm, they're working within a rigid framework of report

format style that I gave to them. And it's more of a, it becomes more of a job than an academic slash scholarly contribution. So that's kind of where I see. But, granted again, I was, I was in a trench supervisor position in that exact same scenario, and I guess I never really gave it a thought because I knew that, you know, the sling bullets here, I was, that's something that I was in. Like hey, I'm interested interested in this. really And then they're like, all right, well, go ahead. And they didn't even want their names on it. I was able to publish it all on my own. And so, I am keen to provide opportunities like that for people. But yeah, when it comes down to that all-important peer reviewed publication, having three names on it is very different than having 15 names on it.

B2 **Zack:** Or are there certain competencies or skills, or like, just mindsets [needed]?

Chris: I think, yeah, I mean I always feel like the mindset has to be like, I will go and try to make this, make this work as best as possible. Like kind of come up with those convenient sort of work around, like I found a way. Here's like, here's a [unclear], like something from the national geo like geological survey, where I can just plug in, it will plug in some coordinates that will spit uhh spit out the correct UTM coordinates. Had to do it one by one, I think there's a way of doing it on a mass level but I just haven't been bothering to do that yet because I only need to do really one at a time, that's– and then, you know that I can plug it all into GIS anyway and then Rufus can just flip the switch and just turn it to UTM, so it's fine. Umm. That, I think you're just sort of like work with what you're, or kind of work with what you've got. I mean like sort of our sieves are sort of an example of that. The original sieves were sort of like here's what we got, we have no money, let's just get some like [little/electrical] ties and piece of janky sieve we found and just make it work with some dowel. Like you know, it's super cheap. It's sort of like a [unclear] sort of like on the fly, and you just kind of have, gonna have to do that to be super flexible. And it's sort of like, that's my view of technology.

B3 **Zack:** Were you using the iPads for data collection in previous years, or no?

Liz: No, I never used an iPad for data collection.

Zack: Okay.

Liz: Yeah.

Zack: I've heard a lot about it, and that was one of the reasons why I came, to be honest. And then I–

Liz: Oh, and then we didn't do it. Yeah. No, there there are lots of other projects that do, obviously. But nope, not us.

Zack: And I've that, noticed you know, you're now using paper recording sheets. After, what Rufus told me was uhh some blowback against the use of iPads. Is is that, do you consider that, like, what were your thoughts about that?

Liz: I mean, I'm a big fan of the paper recording sheets. I can't really speak for personal, like I said, I have never used one in the field. But issues I've heard are that when you use an iPad in the field, it's hard to get the iPads to communicate with each other, which is frustrating. Like if, but paper, you put that together, right. You put it together yourself, it's your own brain that's putting those together, and keying them into a nice, neat database.

Zack: Database in what sense? In like, like mental...

Liz: Mental database and actual, digital one. And so there's sort of still limitations, I guess, working out the kinks, maybe, on on products that work on iPads. I also, like, if you actually have to write something out, it makes you like think about it more. I still think that's true. I'm sure many people disagree. But I think there's something to that. It makes you act– like the actual physical act of writing helps you work through whatever thought you're having. And doesn't necessarily limit you producing those thoughts. It just helps you, sort of, guide you.

B4 **Zack:** Okay. did How you get involved with [this project], with the [name of the project] project specifically?

Liz: So I got involved, actually through my own advisor, who is good friends with one of the current directors, Chris. So I got involved that way. And then was sort of further recommended, or further, sort of advocating for, I guess, through Bernard, who, of course, has been the director forever.

Zack: So how many years have you been involved with [this project]?

Liz: Only two. Two years.

Zack: So this is the second year?

Liz: Yeah.

B5 As work was wrapping up, Rufus mentioned that Bernard and Hugh were coming by to take a look at the mud brick situation and to offer their input. They drove the three hours from [another archaeological project], each way, to check this out. The problem is that the mud brick is on all four sections, and therefore

stretches across the entire 5x3m trench. This is extremely difficult to dig, as it is essentially baked clay, and now there are only two days left to dig, with the military excercises going on at site (today's shooting was cancelled so we got another chance to work, but the site will be used by the military on Monday instead). Bernard was very perplexed about how thick the wall is, as was everyone, but seemed to focus on the pile of stones in the northern corner, which seem to disrupt the mud brick as a solid, singular unit. Rufus referred to this as a 'core' of the mud brick wall, but Bernard noted how it is somewhat too low relative to the mud brick surface, but was open to the possibility. He referred to the odd configuration of mud brick and ashlar at [another archaeological site], even though such a direct connection seemed unlikely.

B6 I kept doing menial tasks and sieving until about an hour after the break ende, when three undergrads, Rufus, Greg and I went down to the apothiki. It is located in [the city], around 20 minutes from the site, by car. It is a shared, central facility, where people from multiple projects seem to share space. Our group seems to have staked a corner in the back of one shelving room, with a relatively open floor space where people could spread out.

B7 Yesterday, the students went to [a nearby city] to see some of the archaeology out west.

B8 I also wandered over to the southern trench. They worked extremely fast on an eastern extension of what was already dug out. The fact that they already had the stratigraphy was credited as a reason for why work there progressed so fast.

B9 **Zack:** hahaha. Umm, so uhh, I guess uhh maybe we'll move onto some questions about, you know, workflows that occur throughout the project. What kinds of, I mean I have to play a little bit ignorant here, so what kinds of material does the project collect? And uhh how are these materials collected? How are they processed and prepared?

Rufus: So just archeo– you're talking about archaeological–

Zack: Yeah, I mean any, I mean I feel like, because I can see that, but I want to see your perspective on that.

Rufus: Sure. So with the excavation we umm approached that in kind of the new world setting in that we have total collection of pottery, uhh total collection of worked lithics, umm total collection–

Greg: Do you need anything? I'm gonna go downstairs really quick.

Rufus: Umm no, thanks.

Greg: Okay.

Rufus: Uhh so total collection of pottery, umm total collection of any archaeological material coming out of the ground, we collect that. Umm starting next year, we are going to do a palaeo-ethno-botanical kind of approach to things. Uhh with that whole endeavour then, it's once we're, which you've experienced here in that middle trench, we've had inside structure materials, and we're working with uhh a colleague of mine, John Marston, umm back at BU, he has his own palaeoethnobotany lab, so over the, uhh over this next couple of months or so when we're finished in the field in preparation for next year, we'll get the sampling strategy umm because we want to have a robust quantitative approach to the collection of those palaeoethnobotatical remains. Umm the flotation and things like that. So total collection of pottery, and we're gonna do the botanical stuff, umm total collection of any other material. Now once that material leaves the field, obviously it's recorded in a very systematic way. As you're aware, it's tied to the stratigraphic unit itself. Anything of note found in situ is also given a special find number, that becomes a special find, and it's inventoried separately, after the processing is done. Once all the material goes in, ceramics, they're all washed. Umm faunal material is not washed umm. Uhh obviously any metals, we have quite a bit of metals, none of that stuff is washed. The ceramics, once they're washed, that's something that then they are uhh analyzed using a uhh SUIR form, so stratigraphic unit inventory recording form. What that then does for us is we count every shard, we weigh every shard, and then we batch it up by ceramic ware. Anything within that is that is highly diagnostic or useful umm in the interpretation or dating of the site, we take that stuff to the side and inventory that stuff as well. And so that, then the rest of that material, having been quantified then gets bagged, gets put back in the bag, and that goes into storage. Uhh the inventory stuff, then there's a whole new level of recording when there's an inventory catalogue sheet.

Zack: This is for the diagnostics?

Rufus: Exactly. So the inventory catalogue sheets are then taken and number of, a whole new layer of of information is gathered from that. You know, basic weights, thicknesses, umm heights if there are umm, what type of material it is, any type of publications from comparanda that we can bring in. Then that material then becomes the basis for the publication of the catalogue. That, with the generic quantitative information that we pulled from that other material.

Zack: From the non-diagnostic material.

Rufus: From the non-diagnostic, yep.

B10 **Rufus:** From the non-diagnostic, yep. Umm we have uhh Wally that comes in and does the faunal remains, every year he comes in and does a full read on that stuff.

Zack: So will he be coming this week, or...

Rufus: Umm he usually comes after we leave. We usually run pretty early compared to other projects.

Zack: Are you sticking around when that [unclear]?

Rufus: So what we do is we bag everything separate for him and–

Zack: And he just goes to the museum and...

Rufus: He goes to the museum, he reads four or five projects when he's there, and he gives us that–

B11 **Zack:** Do you think that specialists might need some different kinds of, like do they be putting in requests for specific things?

Rufus: So our, no, our faunal person never asked for stuff, but with the the botany stuff–

Zack: Because they provide their own forms, and the templates or whatever, you don't have to...

Rufus: Yeah. They give us a full report, and we then take that report and rework it as part of our department of antiquities report and as part of our publications.

B12 **Zack:** Would you, but is there more room, like so, the specialists are not as much involved in that process of synthesizing for that, then. You just take the key conclusions and...

Rufus: I take the conclusions, so if I was doing it, I would take the conclusions and I'd work them into the overarching argument.

Zack: Yes, can you just explain the overall process to me, maybe make it more clear. Yeah.

Rufus: Yeah, exactly.

Zack: Yeah. No, I mean...

Rufus: Oh, you're asking me to do that now? Okay. So the overall process being alright, department of antiquity report, whatever specialist report comes in, that's immediately appended verbatim into the final report, with on their

name it. When it comes time to actually do a peer reviewed publication, there's a lead author. That lead author has access to that document that they can cut, paste, amend, bring in, rework, whatever they want to do, including those specialist reports. Once that document is then complete, the other co-director gets it to read it over to make their changes. Once that's done, that then goes to the specialist to look over their stuff, to make sure something wasn't misconstrued or whatever. They will then fix, amend as necessary. Then the primary author goes through it all over again. As far as pictures and images go. Those are then created, and then those who made a contribution to the paper, they are listed as authors.

B13 **Zack:** Are any there potential areas that will, like that you think you may, that you might, that you may have a big role in be producing?

Liz: Sort of like spearhead?

Zack: Yeah.

Liz: It's both the blessing and curse of having directors that are really talented, in that they take control in a lot of these things.

Zack: I guess it's also, like you're doing some things that are very similar to what other people do in that area.

Liz: Right. Yeah. So my skill set overlaps almost 100 percent with Rufus's, except for my technological abilities are less. Haha, so there's, you know, my, I'm sort of like a redundant person.

Zack: Well, I wouldn't go that far.

Liz: Well, you know what I mean. So I think, or what I guess what I hope to sort of spearhead in the future is processing and querying data once it's in the database. That's my goal in the future, in a way that maybe the directors are less interested in doing. And I think that's because my own dissertation is all about querying datasets from across sites and figuring out patterns. And so I want to do that here.

B14 Yeah but Vanessa and uhh Liz, they're both PhD students, and I've been very open with them and like hey, if there's something you're interested in and you wanna, there's something you wanna incorporate in I'm receptive to this.

Zack: Have they been receptive to it?

Rufus: Umm Liz for sure. Vanessa, this is her first year here so she's still kind of getting her bearings really. Umm.

Zack: And you were a graduate student here.

Rufus: And I was a graduate student here, yeah.
Zack: Yeah.

B15 **Rufus:** Yeah. And that's, you know with with, the great thing is is I got lucky in that that I came to this project, and this project was run in a very responsible way. And that was my first experience in an [name of the region] context. I've been on other projects in the US and England, this was my first year in [name of the region] experience and it was a wonderful one. Because then when I went on to other projects, some were great, some were not so great. Across [other nearby countries], uhh a couple of other projects here [in this region]. There were, like, okay I know not to do that. Umm shit, I can't believe they're not doing it this way. Uhh but you know, still being a, being a productive member of the project, and then once umm there was a, an exit strategy in place after umm I start focusing on this project. That was, that was the goal.

B16 **Zack:** I noticed there's lots of people overlapping.
Rufus: Yeah, that's on purpose. Yup. I mean we have a site that can make a unique contribution to the Hellenistic period and our understanding of it, and it's better to have ten brains to do that than one. Umm–
Zack: Do you find there's more agreement or disagreement because of it?
Rufus: I find that there's more agreement. I mean the, I'm a laid back guy. Uhh we have no room for drama on the project, or you know, competitiveness or conflict or whatever, I shut it down immediately, every single time.
Zack: Yeah, I noticed that this is a very calm project.
Rufus: And that's, that's [unclear]. Yeah, it's better for– it's just way better for peer co– there's a pretty big cognitive process here. You're creating data that didn't exist before. You're making interpretations to create more knowledge that wasn't there before. And uhh it's better to do that in an environment where people are enjoying being around each other. Umm that people have certain views towards something that you have and whether those views are for or against it, either way that's a good thing. Umm and so those are the values that we extend in the project. Collaborative environment.

B17 **Logan:** (from a distance) Hey, Chris! We're ready for pictures and points, uhh to close out both those units.
Chris: Ok! Everybody is. So I have to do photos here, here, here and there hehe

Logan: (joking) I think I'm more important!

B18 **Liz:** And then if you can just take one point there, and one point right in the middle, umm that's all we need.

Oliver: Ok.

Liz: And then you're free to start digging and I'll help you out in a minute.

...

Chris: So what are we doing?

Oliver: We're taking points.

Liz: Just one where you dug.

Oliver: Here?

Liz: Yep, yep. One in there, and then one over there is fine, somewhere in the middle.

...

Chris: It's excavation unit [redacted ID]?

Liz: Yeah. Closing.

Chris: Alright.

B19 **Greg:** So here I have different tables, and I'm normalizing the database. So instead of just creating one table with all the data, I'm creating multiple tables and developing umm foreign keys and relationships, and the primary keys and things like that. So the umm tables I created is area, umm just umm, and I did that because even though it's [the site], we can use umm the area, if he decides to have another site, we can just use the same database. And it can easily add just another another to there. So this isn't umm order but the ones that we use, so the stratigraphic unit holds all the metadata from the forms, so this form here, it's going to hold most all of this except for features and photographs and drawings. So it's going to be a separate table, because we have many, like, one to many. So it's easier, that's what normalizing the database is. It's easier to create this in a separate table, and then it link it to the main table. So then you don't have repeated data, you don't have to keep typing the same stuff in, umm that's, so that's why we're doing the, breaking those out. But most of this stuff, and finds is also going to be another one, because we'll have multiple umm things, and keeping it separate is easier to query that table and link it to whatever you need to. So we'll go back here. Umm so there's the fearers and the photographs and drawings tables that go along with the stratigraphic unit table. And the finds table right there, number of bags. So the next one's

ceramics, which is going to be this one right here, so it's going to have this data like in one to many, and it's going to link to the stratigraphic unit. So if you need to create a stratigraphic unit you can find out which number you want, and you can say okay, I need all red umm chronotypes of KWCH. So you can query that from this and it's going to find the SU and it's going to find all the, that, those items. So then we have the catalogue, which is going to be this form, which is going to combine the data, the arte– the SU and the ceramic number, and then they can fill in this data for the catalogue item. Let me go back here. Umm so those are the, I think I covered them all, excavation unit, I just broke that out into its separate table, uhh to keep it umm normalized.

Zack: Yeah.

Greg: So I created all the fields, I created the umm, let's go into one of 'em. Go to the structure. So here you can see umm the ceramic ID, umm it's tied there, SU is a foreign key. So SU is going to tie to the SU table.

Zack: Yeah.

Greg: So that's what the tables look like. And if you look at the others, they're similar. Umm. So here's the catalogue number, you have the ceramic ID number, umm labels, scan, photo, and all this information, umm. That's going to tie to that. So, oh wait, I need to put the SU field in here too. Umm so that's that stuff. Where I'm at now is created the forms. So I'm creating an input form where you can put the data into the database, where you'll go you'll say enter new, there would be a main page, say enter new items, enter new EU, area, whatnot.

Zack: Yeah.

Greg: And then they'll go through, his next, and it would update.

B20 **Greg:** Umm it's cool because I think, it's uhh... so Rufus and I originally wanted to be archaeologists. He pursued it, I didn't. I went and switched to computers because I didn't like the archaeology enough to go and pursue my doctorate.

B21 **Zack:** So what is your job?

Greg: Umm I do, I'm an analyst, umm for a dialysis company. So in the learning, the learning and development part, umm learning and developing type department, it's called [redacted company name]. It's umm, so [redacted company name], it's [redacted company name] which is a healthcare company, and one of their things is, is to differentiate the company, so they have a department

called [redacted department name], where we're the guardians and architects of our culture. So our job is to make sure the culture is alive. And we have different sec– there's about 80 of us and we have different departments. We do [redacted field of work] which does leadership training for senior leaders and people in the field. We put on big events for people in the field. So our company has about 60,000 people worldwide. And just umm a few ago we put on, we invited all the managers and senior leaders to a big conference in D.C., that like 4,000 people. So my team puts that on. Umm there's a group that puts on those huge events. We do all the branding, the creative, umm the decor, and the clinics. We do uhh village social responsibility, which we do umm, we have like a village green team. So our company is going completely carbon neutral, so they handle that. We do uhh community support. We give like millions to, we've given millions of dollars to local non-profits. So every year umm, we have clinics throughout the world, uhh mainly in the United States, we're in 13 umm companies. So each clinic umm, what we do is we give them a thousand dollars a year and say take this money and umm talk amongst yourselves and pick a charity to give it to. So our goal, our umm motto, not our motto, but we belie– we're a community first and company second. So what that means is umm, we care for each other, we care for our community, and our culture is the [redacted department name] way. So the [redacted department name] way means that we care for each other like we care for our patients. That means like you just don't show up to work, take care of the patients and you're done. If your teammate is having a hard time, you help them.

Zack: So what's your role, specific role on that team?

Greg: So I'm an analyst of special projects. I umm report up to the ch– uhh umm to the chief of staff of the chief [redacted work position] officer. So I do, kind of, all kinds of projects, all kinds of analytical work within the department. Umm I'm kinda not in one lane. I'm kind of doing anything that needs to be done. So I pull reports, I create powerpoints, I do things like this, I find ways to make things work, efficiently.

Zack: Mhm. And do you have a particularly technical skillset that seems to be, seems to allow that, right?

Greg: Umm, yeah. Just umm more analytical minded, able to get things done that in different ways that other people might not be able to.

B22 Zack: But were there any people who particularly led you into this direction

to do digital work?

Liz: Yeah. So umm, I mean, Bernard was one of the crucial figures in sort of making sure that we, as graduate students, knew a lot about what was going on in the digital aspect of the project. And the other person is Lewis, one of the directors of the survey, who came to [our university], where I was at the time, and gave like a seminar, like a couple session seminar, to make sure that everyone was familiar, everyone who wanted to, was familiar with different ways into digital archaeology. Umm, so those two primarily.

B23 **Zack:** Okay. Umm so, maybe just to go through a little more of a like step by step. What's the first thing you do when you receive a data set like that? Like, like, like distribution data. Like the data proper.

Liz: The data proper. Umm. So. Let me think. So the first thing I do is I, I organize all of that outs– like outside of ArcGIS. Because once it goes into ArcGIS it's like a whole nother thing. So what I, when I organize, you would make this like, databases.

Zack: I mean let's say you, let's say you got an approval from someone, they sent you their GIS data, their pottery data, the spatial data and as well as whatever other supportive documentation they give you. They give you a package of it, let's say. What do you do with it? First thing?

Liz: Mmm. So I, well the very first thing I do is read the notebooks, because that's where you get sort of what they're, what, you know, they're sort of thought process throughout the whole thing, which makes it so much easier to then dive into the actual meticulous data.

Zack: Before I continue, is this for, are you thinking about one specific instance, or is this a general, typical experience?

Liz: Uhh general typical.

Zack: Okay.

Liz: General typical.

Zack: Uhh okay. So can you continue what the next thing you would do is?

Liz: Mhm. Umm so reading the notebooks, figur– getting at like sort of the gist, right? Umm. Cause whether or not it's published, or whether or not, you know, to whatever detail level it's been published, umm it's nice to sort of see that excavation process. Because what I'm thinking about is umm what, what I'm thinking about is what this word assemblage really means, which is a very archaeologically loaded word, but also historically loaded word. Umm

and so seeing the process and how they cr– how *they* created their own assemblages, right? They sort of, like archaeologists do this. Umm so seeing their own thought process, for me, is most important, before then making my own, sort of, interpretations. Because that's how you get the data, umm. This is something I have only done very minimally, but what I'm doing is I'm going to each site and re-analyzing the data.

B24 Greg: So umm, I think that's where the power of technology comes in, especially with archaeology, is umm, giving the data to the decision makers, getting this data easily accessible to Rufus so he can go in, find patterns, umm find, you know, why do all these items have a length of this. Or why is this Munsell in this area. And I think that's where the power lies.

B25 Rufus: Umm, but there are online places where you can go to upload these things, and uhh my work with Mark, quote a bit at uhh [at a co-worker's] project in [another site], umm looking at his information and data, he's put a lot up on file sharing sites, like uhh, I'm trying to think of the name of some of them, I can't, but there are places where you can upload 3D models and type a couple of key words into it, go to this place, google it, google Pompei and you can see these models [unclear].

Zack: Uhh one comes to mind, it's called SketchFab.

Rufus: SketchFab, that's it.

Zack: Is that it

Rufus: Exactly.

Zack: Okay.

Rufus: Yeah, SketchFab.

Zack: Uhh and, do you find that's being used extensively by archaeologists? Or just uhh, or is, do you get a good DOI out of it? Or is it sort of that, would it support this, what you want out of it?

Rufus: Uhh I think it's more of a, kind of just a, I mean it's almost like an Instagram of, of 3D models. You can, you have your profile set up, you can type key words into it, and just throw it up there.

Zack: Mhm.

Rufus: Umm the, uhh, the, the ability to manipulate, measure, umm isn't as great as you would want to see [unclear] or whatever, but it's there, it's useable, it's umm, it's more of a, it's more of an aesthetic thing like hey, check this out,

Zack: Yeah.

Rufus: this is what we're doing.

B26 **Zack:** Are you, do you present at Hellenistic conferences, or–

Rufus: there really isn't–

Zack: Technical conferences, or like specific conferences or like...

Rufus: Our primary conferences, there are a couple of local [regional] ones. There's the [local research centre] workshop and [another conference] this year. And then we usually do, if not both, at least one, either Archeological Insititute America or the American School of Oriental Research, those are the big ones, in the field.

Zack: Yeah. So do you, will you present, I mean, I guess presenting on you're the topic, of the period, on this setting. But also presenting on the region and on the technical tool side. I mean it is innovative, this is an innovative project, in a technical sense, I believe.

Rufus: Right. On the technical side–

Zack: Do you believe that there's a overlap, or that there's a disjoint between between...

Rufus: Between, kind of like culture versus digital?

Zack: Or method versus topic.

Rufus: Yeah, I do see that as a disconnect, yeah. Because on the, in in presentation as well as scholarly, primarily scholarly presentation, publication. Because you know, when you, if your audience is, if people, if you're looking to write something about the Hellenistic world, that is maybe a very different publication than talking about the utility of PhotoScan and creating bulk profile drawings or something. The Hellenistic person is going to want to read that for the Hellenistic material, and not going to give a crap about how to draw using baulks PhotoScan. Just like the other way that the techie people reading your your article on JFA or Journal of Archaeological Science, they're not there to read about Hellenistic people. They're there to read about–

Zack: So there's different roles then?

Rufus: They're different audiences.

Zack: Are there any things that would be particularly, if you could see it being particularly uhh, particularly good opportunities for overlap?

Rufus: Well, that's the big thing. The overlap part, because then it's going, it's using these analytical tools– there's two parts to that I guess. So one, using these as a, using the digital as analytical tools to allow the fieldwork to continue

in a responsible way. Then there's the jump between joining, using those digital tools in an analytical way to discuss the topic at hand, the Hellenistic world. That's the jumping that still needs to be made. Using those digital tools as interpretive devices for making a contribution to the Hellenistic world. It hasn't happened yet.

Zack: Is there any like, I'm just thinking, are there any materials or like things that are specific to Hellenistic that that would be benefit, like? I mean, like I look at like Nomisma as a as a coin thing, I know that coins are a huge part of Hellenistic... Uhh I don't, I don't actually know much about the Hellenistic to be completely honest. But, you know, like coins are big, like I associate with historical archaeology, you know. Whereas, you know, in prehistoric archaeology, which is my domain, like no coins, like. I mean like there's all sorts of linked data stuff going on with coins stuff.

Rufus: Sure. Well, I guess a bridge I could see is with looking at the Plakia stuff, using uhh, the Plakia site in Crete, looking at the quartz hand axes and things.

Zack: Right.

Rufus: Using uhh, using technology there as a way and as an interpretive device to read the lithics and then make a contribution to the cultural aspect. Sure. That's great, that's been done. We've done that.

Zack: But anything specific with the Hellenistic?

Rufus: Hellenistic, not so much. Yeah, because, you're not reading stones, you have coins, you have pottery. We're understanding the pottery. But those digital tools aren't making a direct impact as an interpretive tool for those things. It's, they're used as interpretive tools in the archaeological setting, but that interpretive jump from digital thing to field work, to culture, that just hasn't been made yet.

B27 **Zack:** So that's like a full list of things, eh. So we'll touch on a if that, but lot before we do, maybe we talk about, like an overview of give kinds of archaeological the evidence or materials that you collect or deal with. And what umm. So kinds of stuff are you looking at? And how do these things inform you or help you address the project's overall research interests and goals?

Liz: So I think we're really lucky at [this site] in that whatever happened in antiquity left us a lot. So we have everything from– do you want types of artefact, like all that kind of stuff? Okay, umm. So we have everything from sort

of like abundant shards, of ceramic shards, umm of stone vessels, in addition to metals, both for military function, for economic transaction, all that kind of thing, in addition to architectural implements, things like that. All things. What else am I forgetting? Umm, in addition to animal bone and shells.

Zack: Okay.

Liz: Those kinds of things. Umm, so what we do to answer our questions is think about how those operate in both the architectural context in which we uncover them, but also in their depositional, sort of, setting. So thinking about post, well, depositional and post-depositional processes, and what affected the actual assemblage itself.

Zack: How do these [unclear] inform you? Maybe, so maybe before we get to that, what are the objectives of the project?

Liz: So the overall objectives are to, I guess, at least two, maybe three things. So one is to understand umm, the, sort of, what's going on in the Hellenistic period [in the region], which has been, not an underst– or not unstudied, but perhaps understudied, in the recent past. So to get a really good, solid early Hellenistic sort of assemblage going, ceramically, but also functionally. The second is to talk about imperialism in the [broader region] in this moment where there are all of these different characters on the scene. So umm, and how does that really play out in a settlement? How does, what does life look like in a settlement when there's different empires vying for control of the same space? Two big ones.

Zack: What are the, how do the materials that you recover inform you about these things?

Liz: So umm, sort of thinking about ceramics and in the matrix that they sort of are dep– uhh revealed and excavated in, so stratigraphic units, umm are useful for developing the typology, of course. And then for empires, thinking about, umm not just, oh, there's the presence of sling bullets, so we know that there's military activity, or something like that. But thinking about how those work interacts with the functional groupings of the ceramics, of the vessels themselves.

B28 Rufus: So the reason why I originally was like, yes, I'm coming to this project, is because it is this very discreet early Hellenistic site. And I work on early Hellenistic imperialism using ceramics. And then amount of the data that comes out of here is really useful for me. So that's the biggest reason why I'm

here, in the first place, is because I get to learn that.

B29 **Zack:** So regard– owing to the project history or to the natural composition of the site, are they drawn from certain kinds of or materials practices, or are sort of, are data drawn from certain key kinds of materials or processes, emphasized over others? And like like uhh when you became the project's director, did this change? Like whether any like key processes or concerns that sort of changes when you took over.

Rufus: So from from a procedural standpoint or?

Zack: In terms of procedural also in terms of research interest.

Rufus: Okay. So yeah, this project [name of the project], the [redactname of the projected] started out as a landscape project, meaning looking at a landscape and how that landscape either dynamically or in any other way changed over time. That was the focus of the project. During that time, essentially that permit gave us a chunk of property. We then intensively pedestrian, and a pedestrian survey, various methods, walked that entire landscape, collect that information. Did some remote sensing. Did some targeted soundings to to to substantiate various findings. And then we looked at that landscape change over time. When I took over the project as of 2016, 17, umm around the time I got my description done, my PhD, that then changed to a site-based project, looking at one site discovered within that survey universe. And from there, there's no need to do any more pedestrian survey because that locality had been surveyed at least three times. So at that point then, the methods changed because the research questions changed. The research question was no longer about looking at a stretch of [regional] coastline, looking at it in a diachronic way and see how and in what ways it changed over time. The new research question was, well, this is a Hellenistic site that dates to the early Hellenistic period. This period is greatly under studied and under, really, recognized as an important period of study. Usually, you know, it's a typical thing. Before you have Classical Greece and Iron Age in Cyprus, on the other side you have middle Hellenistic period and then Rome.

Zack: And being so close to Byzantine stuff too.

Rufus: Yeah. And so that that period across the board in the western tradition has been not ignored, but not nearly studied as much. And for my PhD dissertation of data that I was looking at for that all derived from work on a project that I had in Turkey. And one of my primary questions in my dissertation

was really imperial dynamics. How did these Seleucid emperors or Ptolemaic emperors, how did these successor kings, well, how did they, from an imperial perspective, how did they do it? So Alexander, he rolls in, he takes over all these areas and then he dies. How did they pick up the pieces and kind of carve out their own empires?

Zack: How did they distribute themselves?

Rufus: Well, we kinda know how they distributed themselves based on, for 20 plus years they're killing each other until kind of three are like okay, we're in charge now. Umm Ptolemy and too, but Seleucus, and Seleucus Antigonus Ptolemy being the two primary in the eastern Mediterranean. But then after that, how do they do it? How did they create their empires? What mechanisms that they employ to create that empire? Very difficult question, because the historical sources aren't great and the archaeology isn't great because there is a problem with this, there's an, there's not a clear understanding across the board, and what, what makes a Hellenistic ceramic, early Hellenistic ceramic pottery. Because when surveyors or excavators are like, oh, it's Hellenistic. Well what does that mean? Does that mean third century? Second century? First century? What does that mean exactly? And so part of my dissertation was creating these typologies to be able to get more chronologically refined.

Zack: Yeah.

Rufus: And so looking at that imperial dynamic standpoint, looking for a site that dates to the early Hellenistic period that doesn't have a Roman city on top of it, or doesn't have a Bronze Age citadel below it, it's difficult because there aren't many. And [name of the site] represents one of, the only one I know of, uhh that has those features. So then as a result, our research questions from previous project iterations became then looking at imperial dynamics using this site because this site has the evidence to be able to provide a contribution to that.

B30 Students are washing pottery outside, while staff will work indoors. Because more people will be coming to work in this shared space, Branndon instructed people to find spaces to work, rather than spread out in a messy way.

B31 Yesterday also saw the initiation of excavation of a pit by the east baulk. It was initially explained to me as possibly being a rubbish pit due to the fact that it is situated around another small east-west wall midway through the north-south wall. As it was being excavated, a bunch of large pottery fragments were

recovered, as well as a large long bone, which was of particilar concern due to the possibility of it being human. Some speculation was made regarding what animals it might belong to, but no experienced zooarchaeologist was present who could give a definitive interpretation. Chris took some photos with a scale bar and sent them to a colleague who might be able to offer his input from afar. He took the photos using his smart phone, and presumably emailed them to his colleague. I guess we might hear back at some point later today, due to the time zone difference, and his colleague's presumed location in the United States (this being an American-led project). I just overheard Chris talking with his students about the pit, and it seems that the notion of its specialness is beginning to wear off. Its location underlying the wall, however, might still be a loose thread that will need to be explained. Yesterday it was Liz who seemed most perplexed by this aspect of the pit, due to the fact that it does not conform to typical robber pits.

B32 Zack: Mhm, okay. Umm, so you mentioned the uhh informal policies for publishing, and [unclear]. Umm can you just reiterate how you decide who takes the lead on each one, uhh uhh and uhh where you decide to publish, what the reasoning behind that.

Rufus: Sure. So as far as who takes the lead, basically the final report is something that I am responsible for, with help obviously. Umm but ultimately umm that is my, that's my major contribution, in that I make sure, I'm I'm the lead on that. Umm I then take that, and then between Chris and I and Logan, umm this year Logan, I mean in the previous year it was just Chris and I, we umm, we sit down and say alright, who's gonna be the lead author on this annual report that we're submitting to the peer reviewed journals. Umm last year it was Tom. So I gave the report that I did, that he certainly collaborated with me on, as well as the trench supervisors, I gave that to Chris and the last year, and I say you let me know what illustrations you want, I'll make those. You take this ten and you make a peer reviewed publication out of it, not a technical report.

Zack: Uhuh.

Rufus: So that's, it's a technical report at that point.

Zack: Okay.

Rufus: Uhh he then–

Zack: What's the main difference, between them?

Rufus: So a technical report is uhh providing SU numbers, stratigraphic unit numbers, findings, uhh list– lists of special finds, umm excavation strategy, uhh just the very technical aspects of the fieldwork. The peer reviewed publication is one where, well you, we make a peer reviewed publication, where we have an argument, we support that with evidence, and we interpret the [unclear]. Umm any given year, uhh so last year Chris was the lead on that, and this year Logan will be, and then next year I, wi– I umm, we just circulate that around.

B33 **Liz:** Okay. So umm, when we talk of the form we think primarily about soil and relationships, so everything on the top is filled out, umm dealing with what types of soil are we dealing with, and how does it compare with what's going on around it. And of course the Harris matrix. All of the elevations and coordinates are locked in a computer system so umm all those go in later, with the end of the unit, umm once we get all that data, which is all used in the GPS.
Zack: Mhm.
Liz: Umm, uhh. I like to include as much detail as possible on procedure, so right here and a bit on the back. Umm so describing the type of sieve, umm we have 5mm sieves here, umm and then of course water sieving and then finds recording as we go, so make sure that nothing–
Zack: So you have a water sieve, but not here?
Liz: Uhh we don't actually have an operational one right now but we do umm, we collected about 10 bags of soil last year that we need to water sieve that are just waiting...
...
Zack: But you also redundantly do it in the database, I presume?
Liz: Yeah.
Zack: So you have both parallel records then?
Liz: Exactly. Yeah. The goal is to have them match 100%, so the scans of these will be matching.
(flips sheet over to back side)
Liz: Umm, and then our description is for discussing in more detail the relationship between the soil and the inclusions in the matrix that we didn't see before, umm what's different about it, how is it umm, what is its relationship with what came before, what's its relationship with what we're umm finding and revealing as we go. Umm, also sort of exploring, umm, the relationship to the different features, so walls, things like that, umm installations.

Liz: And then procedures. So like discussing types of tools used, umm order, or sort of method and direction of excavation, umm those kinds of things, all go on the back.

(flips sheet over to front side)

Liz: Umm, where a lot of the sort of interpretive and those kinds of things... So like for like the labelling of units, I give them something that's very very vague, that purely describes what we're seeing, rather than interpreting what it means, so just soft fill on that side of the trench, for example. And then in the actual, in my trench notebook, that's where I put all of those thoughts, umm, in more detail.

Zack: Can you show me your trench notebook, briefly? You don't have to go into great detail into what's in the notes, but an overview, I guess.

Liz: Yeah, so, we're excavation unit 20.

Zack: This is the front page?

Liz: This is the front page. Umm so here are umm the coordinates of the uhh, the northing, easting and elevation of the corners. So those obviously aren't gonna move so those are permanent. All recorded in UTMs in 36 south. Umm, the opening elevation at the centre. So really umm, the foundation for how we started. And then sort of a brief sketchy Harris matrix that keeps evolving over time.

(turns page)

Liz: This is just a sketch plan of features in the trench, so that I can keep the numbers straight, and keep referring back to it. Umm and then just day by day notes, including things such as who's actually working in the trench today, uhh what's the weather like, those kinds of things. If someone comes to visit, I write that down, umm it's just a way to sprt of jog your memory to sort of remember which day you're talking about.

Zack: Do you write in prose form?

Liz: I write it in prose form, mhm. With some bullets, there are bullet points and things like that, especially for things like points taken, things like that, umm sketchy little things like that about what the trench looks like at different points throughout the day, just to keep reminding myself about what's going on. Umm and then interpretation, so what can it possibly be, what's its possible relationship. Even if we don't know it yet, I'll let those come out here.

Zack: So really, so that summary, at the top of the sheet?

Liz: Yeah, in more detail, and sort of describing– so this for example, umm I'm

not going to call it a floor on this sheet, I'll call it a floor here.

Zack: It's more open-ended I guess?

Liz: Because it's more, yeah, it's more sort of postulating what could be true and what could not be true. Umm, yeah.

Zack: And do you start, let's say you're starting a new trench, do you start a new notebook?

Liz: Yeah. So each trench gets its own.

Zack: Do you, are these integrated into the database? Are they scanned or integrated into the database at some point? Or cross-referenced at all?

Liz: They're scanned. Umm, as far as I know they're not cross-referenced with any particular points in the database. Umm, our database isn't operating yet.

B34 **Liz:** Umm I have started the, yeah I started the process, looking at other material that I wasn't personally involved with excavating.

Zack: How do you uhh...is there, is that ever a challenge to parse that information, to really come to understand it? Or is it, is it very easy to, does it click with you?

Liz: Umm sure. I think it is more, it's more challenging if you're not there to see it come out of the ground, to see it sort of umm every moment of its sort of archaeological use-life. Umm I think that is, umm it does create an extra layer of challenges. And I'm looking at the sites that I have looked at that I haven't actually been there at the moment of excavation, take really meticulous notes

Zack: Right

Liz: so I'm really really lucky in that sense that I've [unclear]

Zack: what kinds of notes are you consulting?

Liz: Umm field notebooks, forms, umm some uhh projects do their own finds reading before I would come in and look at them. Umm and that's really useful umm. Some have already done complete readings and very thorough and they have more experts than I am in a lot of, in most ways actually, in almost all ways, for some of these. And so they have very thorough, thorough notes umm. So that's useful, yeah it's useful because so many people have been so nice and just being like here is all of our stuff.

Zack: Really?

Liz: Like here's all the notes, umm have at it.

Zack: That's great.

Liz: [unclear], it's just so nice, yeah.

B35 **Zack:** I mean let's say you, let's say you got an approval from someone, they sent you their GIS data, their pottery data, the spatial data and as well as whatever other supportive documentation they give you. They give you a package of it, let's say. What do you do with it? First thing?

Liz: Mmm. So I, well the very first thing I do is read the notebooks, because that's where you get sort of what they're, what, you know, they're sort of thought process throughout the whole thing, which makes it so much easier to then dive into the actual meticulous data.

B36 **Rufus:** There was a funny story for me about PhotoScan is that the, there wasn't, there really wasn't projects out there when I first started using this stuff, in 2012, that were doing this. I mean sure, people were doing 3D scanning, and and and there's LIDAR out there and that stuff, but uhh cheap, easy to do, accurate three dimensional modelling using photogrammetry, it wasn't out. So I was at [another site], and this was the, the first publication, then big one, out in the Journal of Field Archaeology. At [the site] I was with uhh a colleague Lonnie, who is a professional archaeologist and, and uhh he said hey, you know, I have this this intern, umm ask me about this program, have you used it before? and I said no, and then he said yeah, it's pretty great. So we just downloaded it and we were screwing around with it and went oh wow, okay–

Zack: [unclear]

Rufus: Yeah, [unclear] at a uhh, in Oxford, I literally interned in Southampton, just kind of [unclear]–

Zack: Southampton's where a lot of this is happening, eh?

Rufus: Yes, and it just uhh, we did it and it was just like oh my gosh. So I immediately saw the utility and I went to the site director who was a, an advisor of mine at [my university], Mary, and said hey, we have this going on. She said whatever you need, test it out, see if it will work. So obviously I was running the field too so that was, I didn't have much time, I had down time–

Zack: It was an extra

Rufus: Yeah, so she said whatever you need to do, whatever you need. So we did a ton of testing and working with it, called up uhh the JFA and said hey, we're kind of working on this stuff, it looks pretty legit, is this something you guys would be interested in publishing, and immediately they're like yes. So that, we collected the information the summer of 2012, collated it, uhh wrote the article and then they put in the next edition thirteen.

B37 **Zack:** Can you just take a minute to explain it to me? The document that you made there?

Oliver: So, started by drawing just the outside of the square, these lines here. Then inside, with these walls, you know, focusing on getting the articulation on this centre wall where the pit is. Umm, so kind of getting the bigger stones, umm just indicating that we think there is a wall there, and then capturing the general outline of the pit, umm, they excavated, and getting a little bit of definition as far as how steep it is.

B38 **Zack:**Can I get a brief shot of the page, what you're writing there?

Chris: Sure.

Zack: Yeah, it's just basically a photo log.

Chris: Yeah, just a photo log, just making little notes, and then I transfer it to a, like a spreadsheet.

Zack: You keep track of the photo number? Like the file name?

Chris: Yeah, so everything, so what I do is I copy like a reference to the image file name in that spreadsheet, and every photo, and each photo is labelled like [redacted context ID]_P1, _P2, like for each, each, each umm stratigraphic unit.

B39 **Rufus:** Okay, so if we can have just nobody standing on this line, just cause of the shadows kicking over... So can you come on this side?

Zack: Sure, sounds good.

Zack: So the shadow was to, the shadows–

Rufus: So the basic thing with the shadows is that, if my shadow is right here, and I take a picture, and then I take a picture over here and my shadow has moved, the photogrammetry can't find similar points of interest. Because it's looking for that shadow but then suddenly that shadow's in a different position in another picture and as far as the alignment goes it's a big mess.

Zack: Ok.

Rufus: So I always have to keep an eye on my shadow. Obviously grasses and things like that create a problem because they're really long and skinny and they can move one way or the other. And again, it's for points of emphasis, for similar features on multiple pictures.

Zack: Ok.

Rufus: So when you take your pictures you have to make sure you uhh, have enough, you do it systematically and you do it so you have enough overlap, so you know like like 30% per picture. I'm just gonna move things out of the way

a bit.

(moves some buckets)

Rufus: So the idea is you start farther out, you take pictures around. And then you go in, take pictures in a circle, and then you go over the object and take pictures that way.

Zack: Alright.

Rufus: So that's the, that's the goal here.

...

Rufus: Then after you do the big circle, the inner circle, you just kind of go over the top and take some like random pictures to make sure you have some extra coverage on the unit you wanna– to make sure you have coverage

...

Zack: So, when you process these, do you systematically organize them?

Rufus: Uhh, it brings them it and it automatically aligns them.

Zack: Oh.

Rufus: But the thing, the time consuming part uhh they call masking, basically you're cropping out things that you don't want in there.

Zack: Yeah.

Rufus: That takes some time. But if you do that right and run it it'll do a good run.

B40 **Liz:** We took out, we uhh, moved all the vessels off of a floor in one room. And what we saw were these clusters of certain types of artefacts on one side of the room. And then we saw a totally different, not totally different, but a unique set of artefacts on the other side. So this shows us that in the southern end, my theory, right, is that there's umm a shelf on a wall that falls, right. And so that part of the room was used for that, for storing of those types of vessels. The other side, totally different. So, and thinking about how you want to assess the stratigraphic unit in of itself, as, as, sort of, a component, or umm a sort of final component of a bunch of smaller groups, and sort of informs that.

Zack: So how did you control for that?

Liz: So we took GPS points by cluster of artefacts, which were defined based on their spatial relationships to features around them. So we didn't grid it. I think gridding is sort of, creates arbitrary boundaries. So we wanted to create boundaries that could reflect whatever use the room had in antiquity. So we did that. And then collected artefacts, umm, and plotted them by cluster.

B41 Rufus: anyway, uhh you go individually photo by photo, and then you just crop out the stuff that you don't want to be included in the processing. If you don't do that then the model can take eight to twelve hours and then crash and it's a, it's a big mess, just cause it's looking for all those points across that space. So then I had to, kind of, refining your environment will allow you to, to process something and get pretty, pretty clear. So then what we do, obviously this is not a uhh, so in previous seasons you uhh, eighteen for example, taken that model, this is just a report from last year. We take that model and then export it to geo-referenced ortho-TIFF, we then take that and create top plans based on that.

B42 I got a chance to film the (elevation) of a context in the southern trench. Tom spoke his thought processes aloud as he took photos and DGPS points, and I got some over the shoulder footage of him using the DGPS app. What was not captured on film was his explanation of how the data is retrieved. The unit has wifi capabilities, similar to a GoPro, and data is obtained by connecting to an ad-hoc network that it generates, and he exports as csv of shapefiles. Also, the app overlays the distribution of points over an open street map layer, if you've got an internet connection. Tom finds this useful for situating where the trench in relation to the local environment.

B43 Zack: How, it's great umm. Have there been any specific or significant events or, events or people or uhh uhh significant significant events or people that serves uhh umm uhh changes that that have guided you in this direction? Uhh towards, in towards archaeology or that have sort of pushed you into archaeology or into the application of digital methods in archaeology?

Chris: The application of digital methods? I mean there's no, no one or no one thing in particular. It's sort of just my own umm thinking about the... you're kinda thinking about like what would be most effective and most most sort of streamlined umm in in in terms of in terms of recording, tools used, things like that. Umm and sort of like I asked around, I talked [unclear], again, it's mostly under my own sort of initiative umm.

B44 Zack: does the, does the use of such technologies effect the ways that archaeologists work?

Liz: I mean I think so. I think it allows you to either rely on it, and so you say well ArcGIS will tell us so we'll just leave that, we'll plat that in, it'll be

fine. Umm but also, in a, in a good way and in a bad way, right? In a, like, let's speed up this process. And also in a like, so maybe I can be a little bit, you know, less meticulous in the field or something. Umm because of, this is what ArcGIS can register. Umm it can't register finer than that, maybe, or something like that. Umm so I think if it's the only tool that you're using, it certainly would change uhh, yeah it would change the sort of decisions that you make, yeah.

B45 **Zack:** What's, are there anything that's exclusively Chris?

Rufus: Umm so Chris is uhh, so Chris is at [redacted university name] and he's bringing students over this year.

Zack: Right.

Rufus: So he's responsible for that educational component this year. Next year, Logan and I at [redacted university name] will have our own field school as well. Umm so we'll bring out around ten students, and then uhh, and at that point Logan will be responsible for that educational component. Chris will maintain his control of his educational for [redacted university name] students. There will be a lot of overlap [unclear]. But uhh–

Zack: He's gonna be expanding the project, I guess.

Rufus: Yeah, a little bit bigger. And we'll wander around the same trenches, around two or three, but then having delegated groups for pottery washing, switching out that with excavation.

B46 In the warehouse now, with Liz, Vanessa, Chris and Lisa. Liz, Vanessa and Chris are organizing the washed ceramics, trying to make other work easier later on. Also, by bagging the pottery that is sitting out on trays, the trays can be put to use by pottery washers. They seem to also be going through a first pass of the material, noting things that stick out from the rest, and also re-bagging stray shell or other kinds of finds that do not belong with the pottery.

B47 **Greg:** So that's the idea. That's what we're trying to do with the database. Umm now it's just doing the forms, and then, also then the next step after we get the forms to put the data in, we can do a simple export, just like put all the data in an Excel file, and then you can query it or you can look through that. Umm long term, it's gonna build like special queries, you know, forms like that. This is actually my goal. But that's not urgent now. The most important thing is developing this so he can start typing the data into the database.

B48 **Zack:** So you finished developing the schema then?

Greg: Yeah, the schema's done, umm the fields are in there, umm right types, like umm integers for umm binary things are just going to be a zero or one, umm decimal length with thickness, and then text files like Munsell, description, fabric, things like that.

Zack: Uhh, and no data is in there yet?

Greg: No.

Zack: Okay.

Greg: No, just the basic structure, and then once I developed the form I'll go in and add some test data, see how it works, and then we'll delete that and then give it to Rufus, and he can say whoever needs access can access.

B49 **Zack:** So how does, so this this database, uhh back to, more towards the database aspect. It records all the information– would you say it's, it's parallel to the forms? Or that it's a continuation? Like how would you relate it to the work that's being done not in the database? Yeah.

Greg: Yeah. Umm–

Zack: Or, or other digital work as well.

Greg: Yeah.

Zack: How would you relate it to other things that are going on in the project?

Greg: So, if, right now they're just using forms, and Rufus, maybe you can explain a little better. So right now, if he's, needs to go back because other umm groups will reach out to Rufus and say hey, I need some data. Just yesterday umm when Bernard was here, he's like hey I need data on the coins, or or, some piece of data. He was like, he needed data. So Rufus, he can go through and look through the forms, and find, oh okay, I know this, [name of the site] 2018, I remember this SU, excavation unit was this one, and then he'd have to go through the forms and find the data. But if we put it in the database it's a query. It's, you know, if you acc– you know, even exporting the raw data to Excel, he can just filter, find the data easily. Instead of umm doing this. And, while we could put this in Excel, just put this Excel, and I've thought of that for a minute, to keep it simple, umm it's not really scaleable because then you'll have all these Excel forms, you'd have to update it, share it, things like that. This way, umm and this way you're able to expand. So like let's say he's, you know, they want to add a field, or they want to create some other form that they need to reflect upon, [unclear] research on, they, we can add that in.

Zack: Yeah, okay.

Greg: So that's kind of the though process. Umm.

B50 **Zack:** And also, like, how do you keep track of the photogrammetric records? Do you stitch them together? Or do you–

Rufus: There are, okay, sure. Good, good question. So first uhh, first and foremost, uhh as far as what we do, is we create a folder, by date and by trench and feature number. That's one, that's that one folder for that unit on that particular day. Those photos then go in there. Everything is processed, the PhotoScan file is embedded in that folder itself, and then that folder becomes a unique entity. Then umm in, uhh our collaborative space, we're just using Dropbox, and then of course we have a backup for it, two backups actually. Uhh at the end of the season then I take those, and obviously they're in the process of (backing up right now). At the end of the season I'm putting all of those on Dropbox. And some of those can be pretty big, I mean a big one can be a gig or two. Uhh and with the internet in [the region] it takes a long time. So that then goes into Dropbox into a folder, then we have a [project] folder, uhh and then within that we have the year. Within that we have uhh just nested folder. One of those nested folders uhh is excavation. Within that we then have uhh PhotoScan models. Then we dump them in there, and they're all organized by the date. So at any given point, if you want to see a SU from some so on in this trench on this day, you can go and find it.

Zack: Uhh so these aren't, so these are just organizing the process. There's no database or data structure– well there's a data structure in the sense that this whole things is–

Rufus: Yeah, it's not in a geo-database of any kind. It's not in the database. The only thing that's in the database is a list of whatever, the names of those individuals. So you think, okay, do we have a model of SU whatever, we go to the database, oh yeah it's there, go–

Zack: So they're sort of free floating then.

Rufus: They're free floating... yeah, I mean, within that folder hierarchy, and the entire system.

B51 **Rufus:** For Dropbox, for that kind of like storage of data, in almost every project I've ever worked with, they always have a backup hard drive, though. So all of that's still stored somewhere else. So if it's thinking about, sort of, like disseminate– the ability to disseminate and maintain that data, I think that

risk is minimal.

B52 Rufus: Umm essentially I mean there's like the folder of photos, sometimes which gets subdivided. Like I have artefact photos versus site photos. Umm and the PhotoScan, sort of, runs of PhotoScan photos, get pulled out of that general photos folder and get... they're still there but they get put in like their own folder so they're then keyed to the PhotoScan model. Umm, along with the sprea– along with the spreadsheet, and then those will be linked to the umm, those will be linked to like the sheets. But I don't know what, I mean I'm not sure kind of where, where it kinda goes from there, whether we kind of key those into the database themself–

B53 Zack: How does the implementation and use of the project information system affected how specialists collaborate within the project?

Rufus: So basically how does our recording, digital and otherwise, allow collaboration among members?

Zack: Yeah.

Rufus: Okay. So umm, with the the levels at which we record information are designed to allow us to call up specific information needed to address these higher level research questions. So for example, between Chris myself, some grad students, they have all access to the Dropbox folder. So if they need dissertation information on a specific cermaic ware, that's something they can call up. If they need to determine the phasing of a specific wall in a certain area, they can call that information out. So is it, it's as collaborative as it can be. We're not dealing with ru– I know some projects running around with like one hard drive. And that's what they have. It's it's it's awful, and that's also scary. So by putting it in a in a cloud, so to speak, everybody can access it. You can see from a versioning standpoint, also something very important with Dropbox. It allows us to go back to version history.

B54 Zack: Uhh how are you accessing this data from other peop–, other projects?

Liz: Umm through Dropbox, they're just shooting me whole folders.

Zack: Oh really?

Liz: Mhm.

Zack: So this is all stuff that's not really public, but they're sort of like hey, you're a Hellenistic person?

Liz: Ehh it depends. I guess umm, most of them– so the, the uhh, a lot of them

don't post like field notebooks on somewhere that's open to the public. Umm those kinds of things, those are all just shot to me with via Dropbox. A lot of them are, a lot of the the like actual materials themselves are published. Umm but they've been very [unclear] giving me all of their meta– on everything that goes with it.

Zack: Has anyone objected? Or like just not responded? Or is, like what what kinds of...

Liz: Sure, yeah.

Liz: Well everyone's been very nice about responding, which is great. Uhh everyone's gotten back to me and told me ha either yes or no, umm. And they've always said very good reasons if they say no. So no one's been rude about it.

Zack: Oh okay haha

Liz: Yeah, no, I can't complain haha.

B55 **Rufus:** But I would say other projects are more individualized in the sense that if there is a director or the director is writing that report based on the information of specialists that he or she has brought over on their research money, and then they would kind of get more of a footnote than a co-authorship and stuff like that.

Zack: And trench supervisors, are they, they they have a report to contribute?

Rufus: At the end of every season a trench supervisor has to provide a square report. And that is put in verbatim.

Zack: And the authors, or co–

Rufus: They in are the authored department of antiquities report, they are not, unless they make an active contribution, they are not listed as authors in the report, in the peer reviewed publication.

B56 **Zack:** So you're explicitly thinking about data reuse?

Rufus: Oh, absolutely, yeah.

Zack: How are you, like, leveraging Open Context for that?

Rufus: Open Context is an end game thing.

Zack: It is– You said it is an end game thing?

Rufus: End game, in the yeah, sense of we're going to do all of our research. We're going to get everything done and put together for this project. And then my guys, we're going to get the publication done first and then immediately after all the Open Context stuff will be available. Previous in this, the forth-

coming [name of the project] 2 edition, they're getting the Open Context stuff done any day now. Then the book will come out. We're going to do it the other way, like they did in [name of the project] 1.

Zack: Yeah.

Rufus: But with Open Context–

Zack: I noticed there's a second edition a few years later.

Rufus: Yeah. And then uhh, with Open Context and LCP, these digital repositories for data, it's great, it's open access, it's all sharing, I'm all on board with that. That's the end goal after this, the campaign.

Case C

C1 **Zack:** So specifically, what is your role as the director? What do you do on a, what's your– can you give me a couple examples of things that you recently did in your capacity as director of [the consortium]?

George: I mean, some of it's just administrative, you know. Umm, making sure that we have collaborat– what, the university– so the funding structure is that the funds, all of the funds from [the federal funding agency] come to the university, to research account that I have access to. But because of the collaborative nature of the project, we and the program, the partnership grant program permits that we can sub-grant funds to other co-PI– you have to be a listed recognised co-PI, recognised by [the funding agency], and then we can set up a way of transferring funds to those participating partners. So there are agreements and those get fine print and both the research community– the research administrations of both institutions, [the university] and then the other one, whether it's [various other universities], whomever, they sweat over all these details. So I spend a lot of time just like getting those– they're called collaboration agreement documents– finalised, approved and agreed upon and signed. So umm. And also then, in dealing with reimbursements. I don't actually, I mean, we have a program manager person, that's Dwight, who actually does the paperwork. And so he but I still have to like track these things and make sure that they're falling within our budget plan, and things like that. So I spend a lot of time actually on that.

Zack: What about–

George: Also, I I'm in contact with these other co-PIs and their sub-, of, kind projects about– and they have questions for me, or I'm making sure that they're

keeping up. So today, one of the items today was umm we had budgeted in the current, what we're calling what I'm calling [the name of the consortium] 2.0, seed funding for three discrete coring projects. And at the spring meeting in March, at the executive committee, we call it, approved two of those. One is in [one region] and one is in [another region]. So there's a third one, and they have the funding for it this year. And umm, it's very likely going to be a coring project somewhere in [another region]. So it's part of a flurry of emails with some of the different collaborators as well as the co-PI that will be overseeing that project.

Zack: What kinds of communi– what kind of things are in the emails?

George: Just [unclear]– well, so I generally, what I, for that specific kind of funding, we ask them for a two or three page proposal of what exactly they want to do, what their costs are going to be, and things like that.

Zack: What were those, if you exactly could provide some sort of– don't you to give the have name of the project or like the, the– if you can just give an overvoew of what those costs are.

George: So I haven't received the proposal yet.

Zack: Oh, okay.

George: But we've asked them for it. So there was a flurry of emails back and forth–

Zack: What kinds of things would it entail?

George: that –they said they were interested in coring in either the, in a place called, near [a site], which is in the north, like north of [a specific region]. The other project site is out of the coast, a place called [redacted]. So umm, I don't know exactly how this is– like, but I mean, the basic idea is we're very keen to see, to support coring in this area. The co-PI who's most related to it is Leonard, who's at [redacted]. And he's very keen on pulling together what he's calling the [redacted] Research Group.

Zack: Yes.

George: And so umm, and he's got his own field project now at a place called [redacted], which is sort of near umm [specific city and region]. And so I, they've sketched a kind of very general outline of what they're interested in. And now hopefully they'll articulate that in more concrete terms in a relatively simple proposal that will hopefully lay out sort of the concept and their justification for it, the program of how they would do it, and then the budgeting of it.

Zack: So that's the first step of, sort of, gaining some sort of partnership sta-

tus?

George: Yeah. Well, it's, yes. There's two ways this can go about. One is we have an existing institutional partner, the [university], and co-PI, Leonard. And if they decided to go that route, then it's just we would set up a transfer of the funds that we agreed to provide for this–

C2 **Barry:** And so when the project was starting up in 2012, George brought me back to [town] to, first as a postdoc where I was, it was actually two of us, two of us that were postdocs, myself and Joe, who's at [redacted] right now. And the thing was basically for me to manage, help manage the project for him. And so I see myself sort of twofold. One, I'm a little bit of, I'm the puppet master behind the scenes making sure that everybody has what they need to, you know, make their sections work. And so that includes, well, in the first part of, in the first version of [the consortium] I was helping with you know, uhh, some of the accounting, travel, well, not necessarily accounting, but tracking money, making sure people had paperwork the they needed to get their funds to them, making sure that everybody had the resources they needed, organising with Howard the, sort of, the labour, what the students would be working on. And stuff like that.

C3 **Barry:** Then with, well, a lot of this stuff too, I, I'm, I'm talking with Susan on a regular basis, because she is kind of, she's got her her fingers in every little bloody pie of [the consortium]. She is one of these people who is so insanely intellectually curious and also capable–

Zack: I got impression that at the March meeting.

Barry: Yeah, that she just has inserted herself into everything. And so I'm, so often it's, you know, Susan and I working through some sort of problem that has emerged in the data or something that's big that has to come up. And so we're making plans as to what needs to get done next, then communicate that with Howard, things like that.

C4 **Zack:** Is Susan a technical person? Or a she...

Howard: She, well, I mean, she does the ceramics photography. She dabbles in faunal. She's doing isotopic analysis on on uhh [unclear].

Zack: So it's Barry and Susan are like, they're on the ground there, so they're–

Howard: Yes, they're on the ground. So they're part of the core [project] team and they, I mean they're sort of the senior staff. So anything, if if I if I've got

issues with with some of the notes or field records or stratigraphy, I mean Susan is really, Barry is often the go to guy even at, even I guess on the project as well, Susan has more hands on experience I guess. Maybe it's not the right term. But she works, she works more hands on with stratigraphy and data. Barry tends to be more umm as sort of project manager, I guess, is kind of the, what he falls in. He's often running around, doing all sorts of things. Susan's in in the square working and she's really like sort of the senior one who's tying all the stratigraphy together.

Zack: Yeah.

Howard: Those are, those are probably the key, key individuals.

C5 **George:** So one of the lessons that I was alluding to without, I didn't say it explicitly, was trying to create a collaborative environment that didn't try to do a couple of things. One is force everybody to fit all their data into one, that happens to be my, right. That's what it is. Everybody's like my way or the highway. My way is the right way. Let's all gather and then, you know, you guys all change and start following my system.

Zack: Mhm.

George: That's, that, that is, there's a deep antipathy to that in [our consortium]. The other thing that I didn't say as explicitly about these others, but umm these are, those other projects are aggregating, and umm even though there is an attempt to try and acknowledge through publication and everything else, at the end of the day they're still trying to, kind of, consolidate an expanding body of data that essentially one person or one institution is hoping to manage or control. And a core value of the [consortium] is not only that all of the participating projects and researchers continue to retain absolute control of their data. They can also control who has access to it in a highly granulated way. So we have within the [consortium] community, if we call that, could it people who are hard core on one left, on one side of the continuum towards open access. And then we have people who are pretty tight about, pretty traditional and very proprietary about their data.

Zack: That's the case in archaeology in general.

George: Right. And I, and we have a heated debate about this, actually. And it's been a core value that I've fought for intensely that we don't lose is that that all are welcome to come at whatever level of participation they're prepared, and sharing, they're prepared to, umm prepared to umm give or participate that.

And it's no longer a computational problem. Like we can, the systems the software, the systems and software that we use can calibrate access. Like I can say that all of our data is going to be access to everybody except for you. And, you know, we can code it that way. It's very simple. It's not that complicated a problem. So we can, we can create a kind of highly structured and nuanced level of access to data that goes into it, that accommodates the, umm, concerns or interests or requests of the participants. I still think that in the long term what's going to happen is that people are going to become progressively more sharing and more open.

C6 Barry: The whole idea at the beginning was that we were focussing immediately on the [specific region] with a bunch of known archaeologists that we all had sort of been in contact with and working with for, for decades. And, sort of the core concept was bringing everybody's data together, and, into a single, sort of, data frame, if you will, or network. And being able to link and query the data in ways that hadn't really done before. The problem is you get, you know, two archaeologists in a room and you'll have four different ways of describing something. We can never really agree on stuff. And so what we've been trying to do was develop ways that we could actually bring our data together, which was, you know, within a prescribed geographical area. We had a lot of the same chronological periods or there was an overlap, if you will. And so there was a lot of shared data. And so there should have been ways for us to be able to actually work data together at a much deeper level than we normally do. And so that was the core part of CRANE.

C7 George: And so, and [the consortium] is, is, in fact could grow fast– in fact, there's demand to grow fa– Like one of the things that I, we was very intentional in the first grant, by restricting it only to projects in the [regional] watershed, was in part not only to try and create a kind of shared collaborative community that had shared research interests and scholarly agendas or whatever. But it was also because we mostly knew each other, and so we could build a kind of informal network that where we trusted each other because we knew each other and collaborated in various ways over the decades. But that's because we were dealing with about a dozen, I mean a relatively we're still small. But now it's getting into many dozens and could easily become hundreds in a hurry. And there's that kind of interest.

C8 **Paul:**So somebody will be in the field and they'll be working intensely, capturing data. And maybe right after they come home, they'll be working intensely, curating their data. And then naturally they'll get busy teaching classes or doing something else, writing papers or something.

C9 **Paul:** Well the field environment is too fast moving and too sort of hectic. And, you know, time is seen as very precious because you're only there for a certain number of weeks. And so, it's very hard to implement new ideas in that environment. Those new ideas have to have already been thought through before you get into that sort of pressure cooker of an environment. You have to go into that environment ready to hit the ground running with your stack of laptops and your, you know, GPS collector and stuff like that, you know. It's very hard to figure that out once you're there, and you know, the weight of one graduate student, you know, sort of trying to marshal the, you know, the square supervisors to use a certain technology, they just don't have the authority in that sort of environment to make changes or to insist on something.

C10 **George:** Well we, certainly they're supposed to. Umm and I've already become so removed in my own project that I'm not sitting there like hovering over people. That's, again, I mean, Barry is the field super– field director for the project. Part of his job is to make sure that that's happening. And yes, every team has a printout of the manual with them and they're supposed to be making sure that they're using the right descriptions and terminology and metric, measurements and everything. Yeah, absolutely.

C11 **Zack:** One thing I've been hypothesizing in my work so far, looking at other case studies, is looking at how the the recording systems and the excavation strategies are informed by the expectations of what can be gotten out of this, right.

George: Yeah.

Zack: That's why I'm sort of thinking about these feedbacks stuff. But, if, if that's something, you know, I could look back at what you've said in the recording, right. Something like that.

George: I would say that the [redacted] and [redacted] projects would be the best examples of where that's a very driving part of the question. And I can tell you that that there's a lot of similarities, but there is a lot of difference. And they're recording forms, recording systems are not the same as ours. Even

though we started from the same– these are two projects that started from the beginning, umm, there's a lot of– the [redacted] recording system, it goes back to the [redacted] project. The redacted project, the system is, shows influence from older projects in [the region], like the [redacted] project.

Zack: Yeah.

George: The [redacted] project, if you look at their systems, show's influence going, it goes all the way back to like the [redacted] project in [a specific region], in the '70s. Umm there's, there is this–

Zack: What do you think their connectors are?

George: There is this incremental experience, this accumulated experience of–

Zack: Do you think–

George: –and you know, it's an evolution. So some, some things are kept because they work, other things don't because they didn't, or or there's new ways and better ways that we figured out to do it. Since it's I like to a, think of a continually improving process.

Zack: I to think prefer of it as a suitability process, but you know.

George: But it's an iterative process that you can see a connection going back. And I can tell you, when I was really starting to build these things for me and my project like the [redacted] and [redacted] projects, I spent a lot of time reading field manuals. We used to, we had one for [my project]. I haven't updated it now for probably more than a decade. But we have like a pretty thick book, and we used to hand it out. We still do, we hand it out to, when there's a new field person, make them read the poor thing.

Zack: [redacted] is on my committee, [redacted], and he's been telling me about how he has like checkboxes for all the things on his forms.

George: So we have these man– and you can, there are, I don't have them here, I think they're at home. But I mean, a lot of the major field projects in the [region], they don't, some of them actually publish, a few of them have actually published them, but most of them are mimeographed or photocopied or, you know, but there will be a spiral bound thing, you know. And it's a field manual that guides you through the recording, field collection, sampling and recording process.

Zack: Is there a sense that people follow these sheets?

George: Locus sheets. We are obsessed with things that we call locus sheets. You ever heard about a locus sheet?

Zack: We call them recording sheets at [redacted], it's the same. Do people

follow them?

George: You mean the fields?

Zack: The guidelines, the manuals?

George: At [my project] we're pretty–

Zack: Yeah?

George: Yes, they do. I mean, if you ask Barry he'll say well one of the worst culprits is George.

Zack: I feel like that's a common thread that I've noticed. Directors always the worst.

George: Yeah.

Zack: Yeah.

George: Even though I was the one who really helped create it. But then I tend to be, I think that the staff– and I can say that probably because it is kind of funny, for many years I had fallen away from actually, you know, I wasn't in the field. I was running around dealing with bureaucratic stuff, supplying stuff. And we'd spent an hour at the site, seeing, well looking at everybody's work. But in 2017 they said you need to get, so I actually worked a square with a student for the first time in many, many years in 2017. And umm people were upset really with me because I kept sort of cutting corners on the recording process and then they would catch it. How? And this is why I said we, I know we follow it, because there is multiple checks on this, you know, we call it data control. Quality control. And if you don't follow they catch, it catches you.

C12 **George:** And then the sort of second level would be umm, when we're in the field we'd be, in our organisational structure, the [redacted] project is a field project, we organised sort of research teams that are organised by, it's in the, we used to call them square supervisors. They're working in an excavation unit as a team, and they manage the whole excavation of that unit as well as all of the documentation, sample collection and everything else. And each of the leads in those units are responsible for entering the stuff directly into [the database] in the field.

C13 **George:** Actually there's one other group still, within the [redacted] orbit, and that would be the specialists. So you mentioned [redacted], I think you said at lunch with him.

Zack: Oh, yes. Uhh, the–

George: You had lunch with Barry and [redacted], I thought. Or no, Barry

and–

Zack: –[redacted]?

George: Oh it was [redacted], sorry. I take that back. Okay umm, well, anyway, so we have special– whether, [redacted] is a zooarchaeologist, he works on fauna. Uhh Dwight is another one, upstairs, who's working on fauna. We've got umm the conservator. We have object specialists. These different specialists are also supposed to be entering their data into [database] as well. So that would be another group.

Zack: Yeah.

George: They tend to not do as much because they have a more narrowly defined group of material. It's mainly an object and they're, you know, identifying it and getting the locus number or whatever. Because most of the contextual information is coming in from the excavation side. So those are the different groups.

C14 **John:** My work with [redacted], on the other hand, is completely unrelated. And that's sort of [redacted] had put me forward to [redacted] as a candidate for helping with that project because of my experience at [redacted]. I'm basically one of the only people in the building with significant experience with Amuq Valley assemblages. So I was sort of a natural choice for being someone to advise on that material.

Zack: The pottery or metals?

John: Yes. Well, I mean, really, the material assemblages, more broadly speaking. What I'm doing for that project at the moment is just going through and photographing basically everything that had not been photographed previously. So a lot of that is pottery. But then there's also beads, metals, some bone tools and that sort of thing. Pottery is just the bulk of it.

Zack: You're doing that in [this research centre]?

John: Yes. So that's taking place in the registration area of the [research centre].

C15 **Leonard:** And so that's another reason why a big push in [the database] has been to integrate R, the statistical server, an R server, to integrate that with–

Zack: Oh, I didn't know it was integrated.

Leonard: Oh, yeah, we have, I mean, so our data analysis stage is not just, we have a very powerful quering mechanism within [the database] itself, but then what we're working toward, and Amelie's already built quite a bit of this, is

that within the [database] interface you can have a data aware R console where, without special coding, the results of an [database] query can be then formatted as an R data frame, which is passed to an external R server, and the results come back within your console. So you can, you can script, you can write an R job, if you know R, you can have a live thing. But it's data aware, right. So I mean that, so it's it's an enhanced R console.

Zack: Is it basically directly linked to the API?

Leonard: Yeah. I mean, it's within a window.

Zack: Can packages, you use external packages, unique packages?

Leonard: Yeah. And so then you have, R, so the point is, with an R script that you just, umm at a high level of your, your R job, you know, you can script for a high level, and it can be invoking very complex R packages for things like social network analysis or for principal components or what have you, where you simply need to tell, you know, R just needs to know which variables and values pulled out or which columns, you know, of data pulled out of the back end DBMS, should be formatted automatically as an R data frame, for, to satisfy the parameters of the package you're running, right? I mean it's it's not complicated to think about, the design of it. But of course to implement implemented it is complicated. I mean, it's basic idea. But, and so Amelie's done a lot of work on that because we had as part of our–

Zack: She basically's basically making another IDE.

Leonard: Yes, yes. Yes. It is kind of like, you know, Rstudio.

Zack: And that's.

Leonard: It's like Rstudio, but embedded within the larger system.

Zack: though. But a huge feat in itself, that's No one just makes an IDE. It's–

Leonard: Yeah, but. Well, you'll have to ask Amelie to show you that part if you, I mean, it's not something she's working on right now because... But we worked, she worked on it with, and got quite a ways down the road with that with umm, an [federal funding agency] funded project. It was part of our big [funding agency] grant that we got for 1.75 million. Yeah. So for me, but in getting the money from [the funding agency], we were saying it's because we have a platform, [the database], that will support all five stages and especially advanced data analysis using this very rich, open source ecosystem of R packages. And as you know, on R package can be a wrapper around C++ code or Python code as well, like. The point is, R is a great lingua franca. Yet it's also a functional, a simple functional scripting language that a lot of people

know, in the social sciences and humanities. So we chose R, and we, you know, you could a NumPy or, you know, we could have a kind of Python interface, and that's fine. But you can always wrap the Python code in R. And the nice thing about R is that the concept of an R console is really well understood and a lot use of that, where people you can–

Zack: And even annotating and documenting.

Leonard: Yeah.

Leonard: And the idea is that from the R server you get back the results which could be like a network graph visualization, or you know, if you're doing simple P tests, or you know, literally any statistical or analytical method you can think of, you can run in R.

Zack: Could those then be input as derived values?

Leonard: Yeah. Yeah. Then the point is then they can, the results of that can then, will be stored, round tripped and stored in the OCHRE warehouse as more data, results the, right? of The just like you can right now, or for a long time, from the very beginning you could always run an [database] query and generate a tabular results set that itself could then be saved as [database] data for further analysis. Here we're just going one step further and saying now send it out to an R server, get the results instead. So back the data analysis stage I think is pretty important, and umm, it's not been a primary focus of the development work, except we've got a kind of proof of concept of how it'll work, and tried, and you know, we've set it up and made it run, but we're waiting for further funding. I have an [federal funding] grant pending now with a colleague in human genetics for ancient DNA data analysis. And they do a lot of...

Zack: Calibration?

Leonard: Well, they use principal components analysis and a lot of other specialized methods for which there are R packages.

Zack: Yes.

Leonard: And umm

C16 **Zack:** Is the data collected, is the data that's been integrated– or, is the [database] process affecting or having any impact on the procedures through which the data is collected? Or is the data being collected now with archival or [database] integration in mind– or with archival procedures or [database] integration in mind?

Howard: That's a good question. I would, I would say not necessarily, because

I mean, I mean, the field, the field notes, the excavation, I guess, in a way. But I mean, we're not, we're not manipulating or, or collecting in a certain way that's going to be compatible with. I mean, it could be going into any kind of database. So that's sort of the end result, I guess. I mean, we're not, it's not that we're manipulating things or, or gathering it or writing down in a particular way that will be easier to get into, into the [database] system. I mean it's, I mean, some of it may go in, some of it may not go in. I mean, so that's, you know, for the most part, we're trying to get as much, as much as possible. So, no, I don't think that, sort of, formulates a kind of a template that we have to stick to to get it in.

Zack: In terms of practices, though, or just general tendencies.

Howard: I don't even– no, I don't think so. I mean, I think, I mean OCHRE is very, it's really it's just sort of an entry database. I mean, we could, sort of–

Zack: Another term I'd maybe use is mindset. Is there anything...

Howard: Umm. mean, I that's that's the end, the end goal, is to have it in there. But I don't think it, I don't think it sort of, I don't know if pigeon hole is the right–

Zack: All right.

Howard: We're not always thinking about, okay, how how should we, how should we get this data together so that we can get it into [the database]. We just gather the data and then...

C17 **Amelie:** So our goal is to model data in such a way that it's richly structured, so that it can be fetched dynamically for a lot of different kinds of apps on the front end. So we really think of ourselves as a repository of well structured, richly tagged, comprehensive, integrated data that can then be re-presented in a variety of ways to suit a lot of different purposes. So this notion that it can be reused for different reasons really crystallised for me among that group. Because we'd all, then they could all benefit from the same core database, and then use it for different reasons and build different front end apps using the same core data. And this would be true of [the consortium] too. You have got all this archaeology data, integrating it into a comprehensive repository, and in the most rich way that we can, so that it can then just be fetched dynamically or exported or transformed however it needs to be for whatever reasons the scholars need for it. It's not locked into any single purpose or single format.

C18 **Zack:** So turns what people on to it?

Amelie: The fact that everything can be in one place. I mean integration is our key feature. Because we use an item-based approach and don't have tables, we can integrate everything. So my other slogan is a place for everything and everything in its place.

C19 Paul: I mean, one practical implication is how useful is any of this data, and who's going to be using it? And is any aggregation going to be done? I mean, this, I guess, naturally comes back around to what CRANE is working on, which is integration of various datasets. You know, that was sort of the main purpose of that project, and it still is. So like, you know, one of the things I always think about, and you know, when I see people at conferences presenting that, we're oh, putting our data sets online, you know, they'll and give the link and I'll go and look and say well I'll yeah, I see your data there, but what could I possibly do with this data without first massaging it and cleaning it up to make it fit my data? And am I willing to do that amount of work just to get whatever little advantage I would get out of all of that work? You know, so there's this real problem, I think, where, you know, on the one hand, there's a great idea about open data sets. I don't want to suggest that that's not a good idea, it's a good idea. But there's, you know, at the same time, you have to think, well, it's not enough just download a data set. I mean, so I have, now I have everybody's data set downloaded offline on my own hard drive. What good did that do me? I'd have to read through it all manually? It would be much better if there was some, you know, aggregating service that could bring together the various ontologies that people use, or require that people publish ontologies that document their data for it to even be considered properly open data. And of course, I mean all this has been discussed in like the world of semantic web and stuff like that, and self-documenting, and so there are standards that have been established like the World Wide Web Consortium people, you know, for it to be good semantic web, open data has to meet certain criteria. So if yeah, everybody did that I think archeological data would be a lot better. I don't see a lot of that happening. I see a lot of people sort of just say, well okay, I collected, you know, five seasons of field data from surveying this area, now I'm just going to dump all of those as spreadsheets into this place because I don't want to care for the spreadsheets anymore. Which is okay, that's good too, you know, at least you're realising that if you just kept those spreadsheets in your hard drive that they would be unusable in a couple years. So at least

you're doing that. And the file type itself is going to be made so it's open and usable in the future, but that doesn't really make the data itself usable as a aggregation. And that's sort of, that's the ideal I think we should be sort of pointing our sights to, is that it's not enough just to say we want to preserve these datasets as, you know, CSV files or GIS files or something like that. You it's know, like, it should be documented in a way that another computer could ingest it. I mean, that's the ideal. I don't want to have to assign a graduate student to have to, you know, sort through these data sets, just [unclear]. I mean, that's a pretty good goal.

C20 **Amelie:** So [the database platform] started out as a tool for Leonard's research data. And he was doing more philology work at the time for his own dissertation, and technology was new and we all thought we should be doing good things with it. And so he and I devised this way of managing his research data. And it was a bit different from the way most people would go about it, because we were actually trained in data management and database design and had had, you know, four years of formal training in computer science. So we took kind of a first principles approach and ended up with a very different model than what people who are coming to Excel or spreadsheets or dBASE or whatever they would do– Lotus, back in the day. We came at it in a very different way.

C21 **Paul:** I mean, it's really just a chance at the fact that we are associated with the [redacted] that [the database] is being used for archaeology and philology. If Amelie was married to a biologist, this would be a database for biology. And it's just, it's flexible way, you know, so.

C22 **George:** And it happens at a number of levels, but most importantly at the data entry level. If you don't enter the data the way it asks you for it, it rejects it. And so that's one way of checking.

Zack: Yeah.

George: But the other way, we used to do it more manually, we would look through– we had a person who was, who would sit with, full time sitting back at the dig– at our lab, and she went over every single document.

Zack: You gotta be a control freak, right?

George: And and she was this matriarchal figure that would just absolutely run people down until they got their stuff–

Zack: That's the thing about being the database manager for a project, is that

my frustration was that I was given this task of doing that, but no one would listen to me. And I just had to–

George: She, she and people, and I often played the secondary role of listening to her frustrations. And Joe Schmo didn't, was just not getting it down. And then I would often hear from Joe Schmo asking me to tell her to back off because she was really stressing him out, or whatever.

C23 **George:** And so they kept, it kinda kept evolving. And I was always interested and committed to trying to be a beta tester, if you will.

Zack: Because of the friendship, yeah.

George: Yeah. Actually, in the case of Leonard and Amelie, I've known them since the, like I think 1994, he was [unclear].

Zack: You're an early adopter.

George: Hmm?

Zack: You're an early adopter.

George: And so I was toing to be beta tester for their software. And it's evolved over the, what is that, 20, 25 years?

C24 **Amelie:** And I stayed in the software industry and worked for a high tech company in Boston for a few years.

Zack: Which company?

Amelie: It was called [redacted], and they had software called [redacted]. And it was, it was one of the big, it was one of the first big data, before big data was a thing. They collected UPC transaction data from cashier scanners at grocery stores and amassed huge databases. And the head office was Chicago. So I would come out here on business trips from Boston. But then they had this summer project that they developing in the day to manage these huge databases of consumer packaged goods transaction data.

Zack: So what was your role in that?

Amelie: So I was umm, I was uhh, I did training, and managed the training department for few years.

Zack: Training who?

Amelie: Training, I was training anybody from sales reps and marketing people to new tech people they would hire.

Zack: On what?

Amelie: On use the of the software.

Zack: The software that they developed?

Amelie: The software that they developed. So I was either training a sales rep on how he could go out and describe this to Procter and Gamble or Kellogg's.
Zack: Oh, so you would sell the product to– got it.
Amelie: He to be would need able to understand enough technology to represent it. But because I have a technical background, I would also train new hires who came in to do development work with the company and just get them up to speed on the nuances of our product. So I had a quite varied and fun and interesting job.
Zack: How did you get started? It seems like a really neat role.
Amelie: I did a Masters of education at Harvard, and did a lot of education and technology work and worked at their [unclear] and some more educational tech projects, uhh thinking I would develop software for education. I really turned off that for a variety of reasons, but ended up with the credentials to to get into training department for a software company, given my blend of skills. And in those days that was kind of high demand.
Zack: Yeah. Do you find that there are similar– how does, how do those skills were translated in your current work all? if they have at now,
Amelie: I still do a lot of training and interacting who are not with with the technical [unclear]. people familiar So that just is, that's something I still feel like I do a lot. Whether they're students or professors or archaeologists. That's still a big part of our role, is training people and helping them to be comfortable with technology at very different levels of background. Some have no background at all. Some think they know a lot about technology.

C25 **Paul:** But I should say that I have a little bit of computer background, not formal training, but more like experience from the business world. So between undergrad and graduate school, I worked in the business school for five years. And so I've got a little bit of computer experience.
Zack: What business?
Paul: Publishing, book publishing. So there was some database background I sort of picked up along the way, and just comfort with tools and things like that.
Zack: Were you in an IT department or some other department or...
Paul: Uhh sort of business department, like uhh, yeah, a business department where you would have to be working with like inventory of ISBNs and publishers, or uhh and authors their contacts and things like that, so. So I have a basic

comfort level with computers.

C26 **Zack:** Yeah. The so umm, you, so at [redacted], what was your capacity with working with databases? It's, I get the sense that you worked with databases. You are the primary person dealing with databases? Or were you sort of, how how help your relationship, why like were you so interested in– I'm trying to get the link between your connection with the [redacted] database and how that motivated the connection at the [redacted], to work on the [redacted] daatbase.
Ned: Right. Right. Because when I worked at [redacted], I already had experience with the [redacted] database because I worked as data manager with the [redacted] database.
Zack: You went in that role or you assumed that role?
Ned: Well, I also, I had a background in IT, because throughout undergrad I was an IT technician for a few really years, so I'm tech savvy.
Zack: Yeah.
Ned: So I was asked to umm make sure that everyone was entering their data into the database, making sure that it was all proper and done on a good schedule.
Zack: Did you go in with that role intentionally? Or was it you just, you just happened to fall into it?
Ned: I happened to fall into it. I didn't even know we were getting a database until like I had just arrived. And uhh, and it was interesting because uhh, we never really had one that we stuck with. And, you know, so I was the primary person working on the umm, overseeing the archaeological umm data in the database. And then umm, our registrar, he had his own recording system, so he was uploading everything into spreadsheets, umm all the finds data.
Zack: Yeah.

C27 **Ned:** And I think since we're getting newer and younger scholars in the field, they're more in tune with technology today, they're more adaptable and they're more enthusiastic about digital systems.

C28 **Zack:** Do you have, is there a certain sort of trajectory that you, or like a history that you, of your experience that you could explain to me? Or– unless there's a, like, how did you get started, if you can remember?
Barry: How did I get started? Probably it was like grade two or three or something. I had actually an old friend, Anton, who lived down the street from

me, or a street over actually, sorry. And his father worked for, uhh I can't even remember the name of the company, but he worked for one of the, one of the early computer companies that was putting out personal computers. And so he would always have one at home. And so the two of us were always at his place. We were, we were you know, basically writing our own games, although they were were text based games at that point. And uhh. And playing with that. So, you know, I started started off really young.

Zack: There's a, there's an intuition that you have.

Barry: Well, also, my father as well, he uhh, he sort of has one of the first, you know, computer degrees, if you will, from from I guess it was Concordia at the time.

Zack: Wow, that started in like the 70s, '69 or–

Barry: '69 something or something like that. Or or was it before?

Zack: No–

Barry: No, was it Loyola College first, then it became Concordia. So his degree is from Loyola College.

Zack: Because that was the CEGEP thing in '69, yeah.

Barry: Yeah, yeah, yeah. He was Loyola College. So, you know, I grew up with, we, I sort of laugh about it. Actually Ihink my mother still has it, but my dad made a, you know, a Christmas wreath out of punch cards.

Zack: Oh haha.

Barry: He brought a whole set of punch cards home, painted them. We always had stuff like that the around house. You know, I'd always been around computers. You know, granted, I wasn't playing with the servers that my father was, but... I mean my first, obviously we got an Atari, my first real computer, "real computer" I should say, was a Texas Instruments. One of those TI-85 I think it was, or something like that. And yeah, I just basically have always been with, you know, playing with them at some point.

Zack: Alright. I'll get back to these questions in a while, about like computing and digital stuff, digital archaeology with air quotes around.

Barry: I've also always been sort of doing it on a shoestring budget and trying to, like, patch things together. Because I remember–

Zack: That's how it is when you're a social scientist trying to do this stuff, right?

Barry: Yeah. Well, I guess it's, part of it's just my background. Because the TI-85 there in particular, you know, it had, it took cartridges, and then the

other thing that you do is you could actually buy a tape deck. And I don't know how we ended up doing this but we bought the cable that you could plug it in. And then if if you wired it properly, you could actually take a regular tape player and and hook it up so that you could actually turn a regular tape player into a way of recording the data from your computer onto it. I've always been sort of hot wiring stuff.

Zack: That's really neat actually. I have a few friends who would be really interesting in hearing about what you're doing.

Barry: I don't know if I, if I remember the specifics of it because it was my dad, you know my dad–

C29 **Zack:** What's your role in, in OCHRE's project, or also as, as a system or tool? What's your position?

Paul: I think most broadly it's to support projects who are using the database. I mean, that's a very broad answer. But specifically what I, what I do is I consult with people who want to do their research in this environment and try to help them conceive of their research as data. And together, you know, we sort of dialogue and find out, you know, what's the right way to approach the sort of research questions that they want to answer and how can they be implemented in the database. So, yes, everything from text projects to archaeology to whatever else that we're doing, umm Shakespeare and Gilgamesh and things like that. So it's it's getting my head around the people's research questions and helping them translate their questions into data, really, and making the data address their questions.

C30 **Paul:** The best way, again, is in the early planning stages where the dig director understands that they're hiring– hiring is a weird word, but anyway, they're hiring a data manager–

Zack: Recruiting, perhaps?

Paul: Yeah, maybe recruiting. The person gets a little stipend, so there is hiring going on. But they're signing on a data manager for the team, and that that person is going to have some responsibilities that are theirs during the season. And so, I mean, ideally, the dig director gives that person some authority and autonomy.

C31 **Amelie:** And that's been hard because a lot of our projects, like the [consortium's] projects, some of them are still very much in the data collection phase.

So they, they're collecting and collecting and collecting, we go into the with field them every summer. They're still very active at the data collection stage. And so that data is remaining private because it's not published. Nobody sees that data. Nobody sees, you know, we can't show off that data. It's not our data to show off. So we have a huge amount of data that only this single project can see. So we haven't had really a lot to show, the rewards of doing this kind of data capture, data management. But more recently, we've had some legacy projects. And that data is out there, it's public. It's it's becoming quickly obsolete in old data formats. And we salvaged those and created some publications so that now we're starting to develop more of a gallery, where we can show people, look, this is what you can do with your 30 year old archaeology data that is still languishing in old formats and on CDs or whatever. But this is what you can do with your GIS data that was drawn, you know, using plumbobs and, you know, wood paper. You know, here's another way you could present it and actually make it available to your, you know, colleagues in the scholarly community out there.

C32 **Zack:** You were the only person using the database in this other aspect and you had a bit more freedom, right. Did you ever relegate or sort of tell people to do things in a certain way based upon the practices of the database?

Ned: Yeah.

Zack: Anything that like going on?

Ned: So, I did, because at [redacted] we had a bunch of students, like grad students, umm encouraged to use the database every day. I was the main contact for technical support issues, so I would go off to the field and I would help them with umm problems and troubleshooting. You know, sometimes I would send them emails saying this is the proper steps, umm, you know, to do this function in the database, umm. So I made sure that they were doing everything uhh properly. You know, because umm once everything is in there properly like that, then, you know, when Daniel wants to do something like run a query, then it'll it'll just run, no problem and it will catch all of the things that he wants to find.

C33 **Zack:** Umm this, does it typically tend to be one person in that role?

Paul: Yes, but not because that's the right answer, but mostly because that's what people can afford, you know. I mean, in some of Leonard's digs, just because he kind of has access to the [database] here, and to Amelie, you know,

we'll have two or three of us, you know. I think if Amelie and I both go to a dig, then he has both of us there. But the normal cases for us to sort of train up somebody who has field experience, who's done it before, who has some [database] experience maybe, and has time to come here and train with us, and then we just send that one person. And, you know, for them, it's a long days and nights, late nights, early mornings. But it's the kind of person who's in it for the adventure as well as the experience, you know. So it's what they want, you know? I'm amazed that these people would do this because it's exactly what they want.

Zack: Yeah.

Paul: And they come home happy. It's like, wow, good for you.

C34 **Paul:** And, you know, a couple months go by and they'll open up [the database] again and they'll think, oh, my goodness, I can't find anything. How, how how do I do this again? So there's that challenge of, you know, anything that's sufficiently complex, you know, requires consistent use. So it's hard to sort of figure out the best way to solve that for people. You know, is it like training videos that they can pull up on their own or is it wikis, or is it, you know, just telling them that they can Skype us in any moment and we can answer questions for them, which is usually what we do.

C35 **Paul:** I mean, you can't really deliver a tool and force people to use it, or even just ask people to use it. They kind of have to want to use it and have some sort of vested interest in how it works and understanding how it works. And even a voice in shaping how it works, umm, is even better. That's the ideal. So the people for whom [the database] works best are those people who take a seat at the table and make their voice heard about how they want it to work for them in the field. Because then they go out into the field with a clear understanding of what it will do, what it won't do, etc., what it should do and shouldn't do, you know. And we have a couple of people who really take it upon themselves, well ahead of the archaeological season to, you know, say, okay, we have to have a sit down meeting, I would all outline the things I want to do that are new this year that we didn't do last year, and figure out, you know, how to make that happen in [the database]. And that's the best possible way to implement these sort of tools.

C36 **George:** I had been a part of efforts, and there's still some ongoing work on

this. In fact, I was just at annual meetings last week, in San– two weeks ago in San Diego, working with people in the [redacted] region of [broader area]. I would say my first efforts of trying to build a, collaborate with other projects and other researchers in a regional context was uhh, was in the context of [this region]. And I, there, we all got along well. There were no negative issues around collaboration. It was basically money. It takes money to help facilitate this.

Zack: Sorry, when was this?

George: Well we, I mean I started in my disser– I did my dissertation research in 1992, '93. So the [redacted] pro– I was, I became involved with one of the excavation projects, it's called the [redacted] Project in, that was already in 1987.

Zack: Okay.

George: But anyway, in the '90s we were trying to build this regional collaboration. I had my own project that started out of my dissertation, which was excavations at the site of [redacted].

C37 **Zack:** And so are you, so you mentioned how you were recommended for the position because you are, you're very familiar with the assemblage. So you had pottery training, you were taught about the pottery beforehand? Or you picked it up just because you worked at the site, or?

John: I've been at [redacted] for the working last eight years, and part of my job as a trench supervisor is that at the end of each excavation day, we go out and we sort through all of the pottery that we excavated from the day before, once it's been washed and cleaned and everything. So I've basically learned about the Amuq ceramic typology, particularly for the Middle Bronze and Late Bronze Age through pretty much direct hands on training.

Zack: And you mentioned that it's like a 30 minute drive away.

John: [redacted] is about 30 minutes away.

Zack: So it's within the same sort of ballpark.

John: Oh yeah, definitely. Like I can, I can recognise pretty much all of the wares that are coming out of this material. There's some differences in sort of the fabrics represented, but that actually also maps on very well to other trends that we see in the Hittite period where they're having mud bricks shipped in from over by [redacted] where [redacted] is located. Umm, the soils over there tend to be much more iron rich giving them a more reddish colour and have a

lot more calcium inclusions in them. And you can see that reflected in some varieties at the [redacted] ceramic as well.

Zack: Very interesting.

John: But once again, the actual shapes are the same, but you can see this difference in sort of resource catchment at a very macro sort of way.

Zack: And you've worked with that other site, where you can brick.all this stuff. The one with the mud see

John: Oh, yeah, so that's [redacted].

C38 **Zack:** How do you, how do you communicate with [the consortium] partners?

George: Ah, that's a good question. I mean, email, certainly. But we were just discussing this earlier in the week. This is another problem that I, that got I've that I'm not– to, I think it's a problem or an issue, a concern and that I haven't operationalised as much as I'd really like. In the first grant, we go to a point where I think it is working well. But I was, I would, on a consultant or contractual basis had hired a writer who, and we produced an in-house, a monthly in-house e-newsletter, that would have stories–

Zack: I stopped getting those haha.

George: Stories, you know to up keep people to date with what's going on, letting that there's people– so sort of the the [consortium] in- community, let's say, was aware of what was going on. But the person who we found to do it, she got a big job somewhere and went off to that. And that was, we it in the first grant did so we didn't replace her immediately. And now on the new grant, I haven't been able to put together someone who can help us do that.

Zack: Do you–

George: Think it's actually quite important. Because the [consortium] community is so distributed, dispersed that, so Leonard and Amelie I told you were here on Monday. They were in town because they're from [this city].

Zack: Yeah.

George: They're visiting relatives, and then Amelie said well we're going to be in [town]. Let's get together and get caught up. So they, so they did. And they spent the day here.

Zack: So lots of in-person communication as well.

George: And so, but they didn't– I spent hours updating them on a lot of stuff that had been going on that they hadn't heard about since, that had happened since the March meeting.

Zack: Interesting.

George: And it wasn't because we're not, I mean, it's just we're busy and just didn't get around to it.

C39 **Howard:** Well, again, we created– Once we, once we had the funding for it, I mean, we were, I was able to apply for the work-study positions through the university, and [the consortium] has 30 percent of the funding, the university [unclear] 70, that's how work-study works. But we were able then also to, as part of our budget, we were able to pay research assistants. So we were hiring grad students to help integrate. So most of them were either undergrads or grad students.

Zack: Yeah.

Howard: Not all of them even in [our department]. I mean, so it's really, you know, some of them are coming from outside.

Zack: Which, where outside?

Howard: I've had people from fine arts, I've had people from anthro, the iSchool. I mean we've had–

Zack: Yeah.

Howard: Well right, I mean it's based on their qualifications. So we're not exclusive to it, you know, it has to be [an in-department] student. I mean, so...

Zack: [Unclear] archaeologists?

Howard: Umm, mean that– I as it's listed as one of the expectations, it's not a requirement, but having a background in is pretty helpful. I mean, rather than having to train them when the locus is and what, you know, area and– I mean it's really important to have a little bit of background. And I do tend to take people that that have got some experience in archaeology just because–

Zack: Is this for grad students or for work-study or both?

Howard: For both. Specifically for the [consortium] project in that regard. Because I mean, when they're actually looking at reading through some of the, some of the field notes and records, and I mean they if don't even know what it is, you know, some of the terminology is, I mean we got to start afresh. So really, if they've got a background we can, we can start off running, which is really important.

C40 **Zack:** But in terms of recognizing it in various–

George: But in terms of formal incorporated recognition we haven't that. Some projects will, for like seas– these kind of seasonal reports, that they will

publish. We don't publish our seasonal reports, but we make them publicly available.

Zack: Yeah.

George: But people who write and publish in journals, whether they're essentially a seasonal report, I just don't think we should be doing that. You can debate that. Sometimes what they will do is they will list the entire team that was there that season, in like a footnote.

Zack: Yeah.

George: What I do is I list them all in the text of my seasonal report. So you can find out who was all there, and they're all named, but we haven't put them into like, into it. Like if in the same article I showed you a table that we published, I don't have in the caption the name or or the whatever initials of all of the potentially hundreds of people who were involved in tabulating the data.

C41 **George:** I think the best example on this side is what I just made with the Land Cover 6K guys. And that's happened in the span of less than a year, where we didn't, I didn't even really know they existed practically. To now, we've got this community of scholars, of researchers that are claiming the data. Like they want, they want it yesterday.

Zack: Yeah. Yeah.

George: And it's suddenly like oh, my. And I'll have to tell you, the stress– I see, you know, that comes out in our con– like when we have our sort of consult thing conversations within the CRANE, sort of core CRANE group, it involves people like Steve Batiuk and Lynn Welton and others around the Land Cover 6K thing, it's high stress because there was something like working overtime to try and supply the data.

Zack: Whereas archaeologists just don't have this need?

George: Of course they do. But I think we are primarily focussed on on the whole data collecting, data processing side of it and not yet still really on the side, analysis which is what I've always wanted– like for me, that's really what I think is where our biggest impact is going to be. And that's part of the reason why I've been so keen to collaborate with groups like the Land Cover 6K once I discovered, once we've discovered them. Because I think it's going to kind of force us, because here is a community of scholars who are clamouring for access to this data, that's going to kind of force us to develop an efficient, functional way of getting them the data.

Zack: So uhh–

George: So that's, that's, it's not, it's kind of been a mess. It's sort of the classic making sausage, you know, it's a messy haha– it's not like, mess, no one's really beating on each other yet, that I'm aware of. But it gets tension because it starts, you know, somebody, let's use Lynn as an example, she's got her own research that she's interested in. And now she suddenly finds herself sort of trying to help construct a kind of system that can feed the to data these interested users. For her, part of the benefit is because they hope to publish articles describing how they developed the protocols, if you will, for doing so, right.

C42 **George:** Because, umm, it's so, one of the other sort of implied connections is, it's called the shape matching project.

Zack: I remember, it was a fascinating demo.

George: That was with Eugene Fiume who's a, who's in computer science here.

Zack: I really found that really interesting.

George: He's now also the Dean of applied sciences, faculty of applied sciences at SFU. So he's a bit scarce. But he, one of the things I have to say, and I say it on the record but umm–

Zack: Well this isn't going to be shared.

George: I don't want to be– I don't want to belittle it, but one of things that has been very gratifying in that relationship, I think it's been a fantastic partnership. It's not an institutional partnership because he's a part of the project as a faculty member at U of T, Eugene. He's been fantastic in that sense. But what's been very gratifying is that when we started out, this goes all the way back to the first CRANE round, we started out when we were talking about projects to work on collaboratively with them, we started with BA, BS, undergraduate students. And then it graduated to sort of like a special honours project for an undergraduate student. And then it graduated from that to a Masters student. And now it's at PhD.

Zack: The same student?

George: No, no. It's different are people, there students. But the level, what's happened is that the level of complexity and the research, sort of, challenge or interest that it's been generating on the computer, computational side has has elevated up to the point that it's working at, I if you're mean, involving a PhD,

a computer science PhD, these are people that, in that field, are going to go off working and the, sort of, Googles of the world.
George: [Probably making crazy money.]
Zack: [Do you think they're grasping]
George: So for them to be devoting, even if it's only part of their energies and time on our projects, is actually quite significant, I think, on a research point. But secondly, on this applied dimension, it means that, I believe, they think that there's going to be potential commercial application.
Zack: Do you think they're grasping–
George: And they want to benefit from it.
Zack: –grasping the archaeological values and [unclear]?
George: I think Eugene is, part of what makes him an exceptional collaborator–

Zack: Like are they committed to the archaeological mindset? That's a big thing about computer scientists that I find is very distinct. Engineering people, and–
George: I, this is different. This is what I was, it was a criticism I had and I think it was, I didn't want to say it as a criticism, but it is a criticism. It's, well, let's put it this way. It's why I, one of the reasons why I think the ETANA, ETANA-DL didn't work, was because the lead computer scientist in that project, he would come to the conferences and listen to papers, but I think he very quickly figured out what he thought we were, what kind of a beast we were, or creature. And then had a solution to it. And then he stuck to that. And I don't think he ever really... I mean, I remember having many conversations with colleagues feeling like we weren't, we didn't have a voice. Like he didn't care to hear what we had to say.
Zack: So this, but these students–
George: But Eugene has been great. He's been a great collaborator in that way. He's not only spent quite a bit of time trying to understand us, but we have two-way conversations, and that's amazing.
Zack: And the students.
George: The students, yes. I haven't been much, as as involved with those conversations. The current PhD fellow tends to be a bit reclusive. And I think it's more of a personality than it is anything else. So, like for example, we had a session a couple of years ago at the ASOR meetings when they were in Boston, and they flew him down to give a paper. He'd come up with some brilliant

solutions advancing the shape matching project. And umm haha, nowhere he's to be found. The session starts, still not there. And then literally, like about 15 minutes before his paper was slated to be delivered, he walks into the room, gets up, gives the talk. And then, I had never met him yet. So I was looking forward to the meeting and so I thought, was like okay, I glad you're here. And I'm, I was looking forward to having a conversation get to him a bit know and after the session. But I was, because I was chairing a session, so when the se– you know, he finishes, we had or one two more papers, the sessions end. I'm like, where's Andy? He's gone. He like skipped town.

Zack: [I went to my first tech conference a few months ago, but it's a very different kind of conference.]

George: [And I don't think he didn't want to be there, but he was so reclusive.]

George: And I've only met him so like twice, two, maybe three times.

Zack: He's thankful for the funding, I guess.

George: Haha. So he hasn't spent a lot of interactive time with us, but.

Zack: The other students, though. The– do you know if they'd done anything else in relation to archaeology? Or that would be sort of–

George: At least one had. One of them was an archaeology student before she moved into computer science, I think.

Zack: Yeah. Kind of like Sandy and David.

George: Yeah, I think she. I mean, again, Steve might be better placed to be able you to tell what some of these people are doing. Because I think that one's, it's a female student, who was really sharp, and I think she might have gone on to grad school.

Zack: In computer science?

George: In archaeology I think.

Zack: Oh.

George: I don't remember now.

Zack: Okay.

George: I forget which way she went.

Zack: Like, but if these were people going off into Google and doing these things with archaeological knowledge or like this mindset, are they, are they finding it valuable, do you think?

George: I don't know.

Zack: Or is it just a fun project? Not that I'm dismissing that.

George: I don't know, but this PhD I mean he's a significant guy, spending effort on it and I think, when I talk to Eugene, I think he thinks that he is serious about it and sees it as a career advancing, his participation, involvement in it is a kind of, part of a conscious career advancing strategy.
Zack: That's great.
George: Although, because I've had so little interaction with him, I haven't had a chance to ask or find out, I mean, in person.
Zack: Yeah.
George: To try and have a better understanding of what he's thinking.

C43 **John:** So basically, like the way my setup actually is established is I have my computer here and I have a photography stand here with the camera sort of mounted up there. The camera is connected directly into my computer. So as I am–
Zack: It's not a portable camera, it's a setup.
John: Yeah. an Like it's actual nice DSLR camera and everything, and it's all stationary. So basically the only thing that I'm doing is putting an object in place, adjusting the focus, and that's about it. For every photography session, I basically start off by putting the lights in place, taking a shot with the colour card and then after that I'm not changing the aperture, I'm not changing the ISO or anything like that. The only thing that changes is the focus to account for different shard sizes. Because, you know, when you're taking the profile shot of the shard, some shards are that tall, some shards are that tall. So there's that. But otherwise, yeah, we're obviously trying to minimise the amount of change in light conditions. So everything realistically needs to be very stationary and stable. But as far as actual steps go, yeah, it used to be that the images would go straight to my computer and then straight to [the database]. Now it just goes straight to my computer and I give them to Paul to actually put into [the database].
Zack: So there is a controlled environment, controlled setup.
John: Yeah.

C44 **Zack:** Do you consider yourself to be a power user, in any way?
John: Power user, meaning a particularly fluent with the database?
Zack: Yeah.
John: No, I wouldn't call myself a power user. I have good experience with a limited subset of the functions that the database is meant for. But because I'm

not actually using it for real analysis of my material, I wouldn't consider myself a power user there. If you want to talk about FileMaker, maybe you can say I'm a power user for that program.

Zack: In what ways?

John: Umm just in terms of being able to design databases with all of the functionality I need and being able to use it to conduct actual analysis of my results.

C45 **George:** But with all respect to them, and they're close friends and colleagues, they're, you know, it's driven by the person who built [the database].

Zack: Ah okay. Can we get to that in due time?

George: Well she built, well, you know, they have a succession questions, too, right?

Zack: Yeah.

George: At some point, is that going to make the leap from the founder or creator of it to something else?

Zack: Yes.

George: At some point Amelie, who built that and who did old code for it, is going to either retire or decide I don't want to do this anymore or something.

Zack: And then what?

George: Yeah, that's a good point. And are those questions for her. And, you know, what's her succession plan or long term plan? I don't have an answer for that.

C46 **John:** I mean, you can basically see here, all of this stuff is divided up based on, well actually trench and locus. So the trench is the letter number, and then the locus is just the number after the hyphen. And then you go in here, and you can see all of this material is sort of given it's A number, interior/exterior, I have a JPEG and a RAW image of everything.

C47 **Zack:** Do you is ever, everything you get for your particular projects, is all equipment that you use supplied by the project? Or do you rely on user or like member contributed items as well? Like do people use their own cameras, or things like that?

Leonard: Right. We we don't expect any of our students or staff to supply their own equipment for the dig's purposes, even laptops. So all of my projects, I buy.

Zack: Why is that?

Leonard: Well, because, I mean, it's it's just what I've always done. If someone brings their laptop along on the dig and wants to use it for whatever purpose, that's fine. But I want to have, I want to know that we have the right equipment for everyone, and that that equipment has the right software on it has been checked and maintained. And so I just think that, that that's a, you know, it's affordable for me. I mean, okay, so there's usually spending some thousands of dollars on laptops or on cameras and so on. But, I don't like the idea of requiring or expecting people to use their own personal equipment in case it gets broken or what have you. And also, I wouldn't necessarily trust that they would have the right equipment at the right time. So all my digs, it's just always been that way. And on the digs I was trained on, it was that way. We didn't, we didn't use... Now, I'm not saying that there are projects, especially small projects, where people, this, you know, it's bring, BYOC or something, bring your own camera. That's fine.

Zack: Or computer, I was thinking.

Leonard: Or computer sure. And umm, but when, you know, for laptops that are being used in the field in really dusty dirty conditions, you know, we buy cheap, refurbished used ones, and all we care about is that they have, you know, they're not ones you want for your personal computer–

Zack: I've had my computer cleaned out at the Apple store every summer, and they always say it's the biggest mess they'd ever seen.

Leonard: Yeah. Well, I mean, we buy, Windows laptops, you can get now for 100 bucks and refurbished, they work perfectly fine for what we need. And then if one breaks, you have some spares. I mean, it's really not a big expense. And then, yeah, they they last a couple seasons and you get more. So again, because the commercial consumer market for this kind of stuff is so huge that you can get you can get quite cheaply anything you would need, including digital cameras with really high quality, you know. So. So I think that gets the whole question of what does an archeological project spend its resources on and what should it budget for. And I would just say that the actual hardware and software budgets for my digs are a very small fraction of the total budget. I mean, it's far more expensive to pay travel costs.

Zack: Yes.

Leonard: And labour costs.

Zack: Yeah.

Leonard: I mean, these are very minor parts of the budget.

C48 **Zack:** For work that's being input in [fieldwork settings], are trench supervisors the ones doing it, or is it people like, is it specialised people who [unclear]

Howard: No, not it's specialised. It usually, I mean, we have, again, it's not a field school so we don't have a lot of students. So the, the square supervisors are usually grad students. So it usually falls on them to enter their data into on their own squares, yeah.

C49 **John:** So I can have, say, a folder for Locus F713 and all of the images for that. And that's just for my own sort of archival purposes.

Zack: What do you, what what do you do? What kinds of archival purposes?

John: Well, just for the sake of, I've taken these images, I'm obviously not going to delete them in the event that say something happens at [the university] where a lot of this material is actually being stored by Susan, or if anything happens with the [database] record, or even if I happen to need access to these images that I've taken. It generally doesn't make sense to throw out data. I mean, it's perfectly good information.

Zack: So what do you do with it?

John: So I keep it on an external hard drive. It's just sort of according to locus.

Zack: Of the photo, or the spreadsheets, you mean?

John: Uhh, the photographs.

Zack: The photographs. Okay. What do you do with this kind of spreadsheet after you're done with it?

John: So I do have all of this stuff retained within, within a folder on my computer. And basically I do keep this information just so I can sort of have a record of everything that I have photographed. So if in the future we, say, run a query and it says such and such a thing hasn't been photographed, I can actually go back through this, do a quick find and see, did I or did I not photograph this?

Zack: So own, you just have your your own independent record.

John: Yeah, exactly. These are not really things that I would use for any sort of research. It's just a matter of keeping administrative records, I suppose.

C50 **Amelie:** Yeah. And it's true. And it's so empowering.

Zack: Yeah.

Amelie: It's so empowering. You get, like, this, this new project. They've got database everywhere. And any archaeology project, their, faunal their specialist has a spreadsheet and their pottery people have different spreadsheets. And, you know, everybody's doing their own data management, data collection separately. But OCHRE can take everything, put it in one place and make it available to everybody.

Zack: Yeah.

Amelie: And in a controlled way. Maybe you don't want your students to see your texts that haven't you published yet. You can control that. There are access features.

Zack: Yeah.

Amelie: So just having ot comprehensive and integrated is so empowering. And people who get that really get it. And wouldn't use anything else.

Zack: Yeah.

Amelie: Because there's nothing else like it.

C51 **Howard:** Again, you have to have access rights–

Zack: Right.

Howard: To enter data. And again, it's all, there's a bit of a hierarchy. I mean, I've got a higher ranking so I can actually manipulate or change data where I might have students or we don't want them to have access to everything.

Zack: Yeah.

Howard: But based on on their status, I mean they have access to either enter or edit or change.

C52 **Zack:** How do you manage access rights for students, for collaborators, for things like that? Who does that and how?

Howard: Well, again, as we have students come on board, I can create a password for them. And there's basically a checklist of what they can and can't do. So I will, I restrict what I think they don't need to do.

Zack: Are different there tiers?

Howard: Yes.

Zack: Can you describe what those tiers are?

Howard: Yeah. Yeah. It's sort of a hierarchy or a tier system where I mean, it's just a check. Will I allow them to this? Yes, yes, yes, yes. That's something that I [unclear].

Zack: What's the basic version?

Howard: You, me. Hahahaha. I mean, that's when it goes to public access. We don't want people to come in and then start manipulating the data. So, I mean, they would probably get, I mean, I'm, we're going to have to think about this, the security down the road. But I mean, it would be simply, can they come in and they can do queries and create maps and things. I mean, that's possible. But not to tamper with, with the data.

Zack: So what's the next level up?

Howard: I guess to start, start entering data and, and really starting to edit, at that point. I mean, that, they, sort of the last one, where they have access to all projects, where most students will have access to one specific project. I mean, they're not working on multiple. Some of them do have passwords. The password will then, they can visually see multiple projects that I may have them working on, that's usually restricted to...

Zack: Are add and edit separate?

Howard: I guess, I have to think of the checklist. I think they may, I think they may be.

Zack: Do you distinguish them when you assign roles?

Howard: No. I don't, I don't distinguish that because most of the students that I have on are adding data, but they are also, if there's any kind of mistakes they need to edit or change. So I mean, it sort of comes–

Zack: And delete is not even in the...

Howard: Well, delete what they've entered. I mean, they prob– yeah, they probably, probably could. I mean, but I mean, to go back, I mean it's all, it's all backed up. But I mean, again, it it's pretty, because they're logging in under their name, it's specifically, we know exactly when and how and who.

Zack: Are there different tiers of students with different access rights?

Howard: There have been. Currently not. I mean, they're all, they've all basically are able to do the same sorts of things.

Zack: Who are the people with higher, at some point?

Howard: It would really depend on the project and what, what they were doing. If they're simply adding or linking, I maybe, I didn't allow it, I didn't think it was necessary for them to access. And, you know, if you're not actually entering or or changing data, then I wouldn't check that box. So if simply they're linking files or, you know, uploading certain things–

Zack: So linking files is separate then.

Howard: Yeah.

Zack: It's another different...

Howard: Yeah. Again it's it's it's very it's very straightforward. They simply have to go in and link the image.

Zack: And people, kind of, people can be upgraded, downgraded or changed to different access throughout all–

Howard: Yes. All I have to do is open up their, open up their file.

Zack: And you're the only one doing all this stuff?

Howard: Yeah. Myself, Barry or Paul and Amelie. I mean, if there's something... I mean, but we sort of have a basic for any student that's going to be working on the project, we we give them, you know, a bulk of responsibilities and they would all be a part of that. And often, I mean, when that student is done–

Zack: Yeah.

Howard: I mean, I don't necessarily delete them from the list, but I just remove all access. So they could probably still log on and view it, but at that point, I mean, they can no longer [unclear] the data. So I make sure that when the student, their contract is over, they're still in the system, but I would simply take away any potential for them to play with it.

C53 The interview with Robert lasted around an hour. I took some notes in my small notebook, which are very messy due to the rush I felt I was in while taking handwritten notes. So I will recall here how that conversation went, drawing from those notes and my own memory.

Started when Amelie brought me over to meet him, at his office in the library. We started talking about my research and Amelie left us alone. He tried to contextualize my research within archival studies, so I had to establish my awareness of the field.

He is primarily concerned with ontology matching. Also manages a large french language context database, art history database, the library catalogue, and various digital collections from across campus. Largely very big, long term projects, with established practices and habits.

C54 **Amelie:** One of them got involved because they went to the library and said, I've got all this data, is the library taking care of data? And we have a long-standing develop– a relationship with the library so they said–

Zack: Here? At University–

Amelie: Here, Yeah. So like you need to talk to Amelie at [the database

project]. Another guy, we were representing at the research computing centre here. There's a a, special day every year to highlight their, their own university's research computing centre. And we have a relationship with them. So they invited us to come and put up our posters. And so they're the guy who's in charge of social science division computing was looking for help to rescue this 30 year old Bolivia data.

C55 **Zack:** Do you think that the use of digital tools and technologies may have implications for long term preservation or reuse of archaeological evidence?

Barry: Absolutely.

Zack: How, specifically?

Barry: Well, especially with, this has been one of the key things that we've been doing with [the consortium] as well is finding ways to, well, establishing a way to preserve the data that we have. Alright, so, you know, this is one of the great fears with, you know, digital data can disappear at the drop of a hat. I've got an entire hard drive, two terabytes of data that right now I don't have access to. I had it originally on one hard drive. The hard drive died, but I had a backup. And over the summer, I went and I left it plugged in and we had a power surge here and it seems to have knocked out my backup.

Zack: Oh no.

Barry: So I am missing a large chunk of data, and so I need to go to a recovery service and probably will cost us close to a thousand bucks to get the damn thing out. Which, why [the university] doesn't have an agreement with somebody, I don't know. You know, considering–

Zack: Well, for the business card thing, an agreement with someone who gives ten dollars off. You know, like that's the...

Barry: I imagine there must be vol– like volumes of umm service of uhh, for these guys. But who the hell knows? But, so yeah, like, digital data can disappear like that. And yeah, you might have the original paperwork, but there's a lot of stuff that goes into the digital, and a bunch of patience that go into it. And so as part of [the second grant], what George did was he pushed for us to have an agreement with the university library, the [university] library. And so they are now going to be sort of stewards of our data. And once we sort of finish up with the project, they will, we will then be transferring– once [the consortium] is basically over, we will be transferring the data. we'll– Sorry, Actually we'll actually be doing it beforehand, but, uhh, before [the consortium] really

goes offline. But we're transferring the data to the, to the library and they are basically putting it into a long term storage in ways that will be searchable online afterwards. So there's be going to digital identifiers that are attached to each little bit of data. And so then [the consortium], like all the data that we collect for [it] will still be searchable long after we are gone. And they make the commitments to as the technology mo– changes, they will move from one–

Zack: As an institution they have that ability.

Barry: So this is actually, it's been a selling point to get people to sign up for the project.

Zack: Yeah? that's great.

Barry: Yeah. it's, Because especially it's becoming, data management is becoming an important part of a lot of grant proposals now.

Zack: Yeah.

Barry: And so–

Zack: We were talking about that yesterday.

Barry: Yeah. And so when, when [the consortium] 2.0 was coming out they wanted a whole data management section. And luckily they had, back and we were doing [the consortium] 1.0 is when they were first of sort talking about it. And so I was part of the discussions of what the plans would be like. And so we– and I came up with a fairly comprehensive plan, submitted it to them, and it actually became one of their examples that they wanted to use.

C56 **Zack:** Especially for the tendency for libraries to push for open access–

George: Well this is the other, this is the other–

Zack: then it would –and go all in that direction.

George: –this is the other point, right? It's that we umm, we are funded, primarily, not exclusively, but primarily by grants from [the federal funding agency].

Zack: Yeah.

George: And [the federal funding agency] has a policy now about umm a requirement of recipients of their grants providing their data at a certain level of access, and we're deeply committed to that. So that's going to drive that, somehow.

C57 **Barry:** But the site was excavated for twnety-so years by Mitchell and it was done under the [research centre, who] were the ones who actually held the permit. And when Mitchell was retiring he decided to hand this project off to

Cayleb. And so Cayleb–

Zack: The current?

Barry: The current guy. And so he was handed basically a truck full of binders and photos and everything like that. And so he didn't even really have a good idea, haha, a good idea of what exactly he had. So–

Zack: Was involved he in the project before?

Barry: The last few years.

Zack: Okay.

Barry: So, yeah, he was, even, Mitchell was retiring, he–

Zack: How long was it going on before, before his retirement?

Barry: Like 20 years.

Zack: Oh, oh! That's a lot. Okay, yeah.

Barry: And so, or fifteen years or something like that. But a long enough time. And so, you know, Cayleb had, you know, all this stuff was dumped on him and so he had to sort of get a feel for what needed to be done

C58 **Amelie:** Umm, a seminary professor who was an archaeologist retiring and he's winding up his work and publication, and umm, and then as soon as he leaves and retires, nobody's going to care about this data.

Zack: So you sought him out?

Amelie: He's somebody we've known and worked with for a long time.

Zack: Okay.

Amelie: But suddenly the urgency of getting it published became very clear to him.

Zack: Yeah.

Amelie: Because he's just realising nobody's going to care specifically about this data once he leaves the broader academic context in which he's been embedded, and from which he's had a, you know, a position to pursue this. And he didn't want to lose the data.

C59 **Amelie:** And umm, this [name of a project] thing that we just did with Barry and George is a really good example. You know, I, I, you know, I almost should've waited. George is off to do his lecture–

Zack: [Unclear].

Amelie: Yeah, I totally will, yeah. It was a really good example of that process. In a week we went from a CD in the back of the [project] volume, that had a database that was password protected and nobody knew the password for this

data.

Zack: Hahaha.

Amelie: So talk about it being lost to the community of scholars.

Zack: Oh man.

Amelie: And now it's an ArcGIS online web app that anybody in the world can see and the query and explore. It took a week. So we have learned a lot about about, about rescuing, about modelling, about publishing data to make it available to scholars.

C60 Paul: And then there's typically a tier of like power users who are in multiple times a week, you know, working maybe even full time, maybe part time, maybe 10 hours a week. So there's that sort of tier of people adding and curating data.

C61 Amelie: And people think that we, we tried to develop based this approach item because it's extremely flexible and, and just, it gives us a very different environment in which to work. And people think that if you have items instead of tables, doesn't that lead to confusion and chaos? And in a way they were organising principles, so the other I thing want to mention is we use hierarchy to organise. And hierarchy is particularly well suited for archaeology, in space and time, in in taxonomic descriptions, so even the hierarchy of descriptors that one would create, is very well suited to hierarchical management. Hierarchy is something that we, is very much the heart and soul of [our database] system. So items organised in hierarchies, rather than tables full of sort of pre-formatted pre-structured data.

C62 Paul: But [our database] is really more of a concept that that. Like that's really sort of the tangible answer to that question. But [our database is] more than that. It's it's also the data model that's behind that app. So behind the app there, there is this database. And on some level the users realise that, but I don't think many, or maybe a handful maybe, realize the sort of, the network of data that's going on behind the scenes. The app itself presents the data in a very understandable interactive way. But underneath it's a highly complex uhh network of data, graph a database. I say complex only in the sense that there's not really a limitation to the types of networks that you can create in the database. I want to say also that it's simple in the sense that there are only a few high level ontological classes of data in [our database] and everything falls into one of those classes. So in a way it's very simple. And if your research is

very simple, then the underlying data is probably also gonna be very simple. But there's no limit to the type of complexity that you could do in there. And we're pushing those limits to find out that there really is no limit. So [our database] is the idea behind the app. It's the schema, it's the data model. It's uhh, it's the whole system of managing and curating and viewing and analyzing and publishing the data. And so it's sort of hard to, you know, fill in the blank of what is [our database]. It's like all of these things at once. The thing that [our database] is not, it's not the, the hard core behind the scenes database software. Like it runs on a database platform or professional database platform from a software company. So we didn't like create a database. We implemented a data model in a database. And it's the implementation– implementation of that data model that's the novelty of what [our database] is.

C63 **Zack:** The whole Portage network, sort of thing. Yeah.

George: Yeah, yeah.

Zack: I'm very aware of that.

George: We were initially going to participate in the Portage one, that triggered a different kerfuffle, which was one between a national level effort and more local or regional ones.

Zack: Yeah.

George: We had signed on to go with the Portage one and then we bumped it. And I had been running on, and this is my view, they may have a slightly different view. But [redacted], whose name you should know, is the director of the [information technology system] at [the library], it's like it's their big digital collection building part of the [the library], and [redacted] works with her.

Zack: Yeah.

George: And I have conversation with [redacted] going back maybe a decade, and then I also had even with [redacted]. For a while, I was on, actually on the library advisory board and we tried to keep bringing this up like a broken record, as, you know, what about large digital art collections or research collections? And they were always enthusiastically supportive, but very slow to accept taking on something, because for them, their mandated mission is that once they do it, they're prepared to do it in perpetuity. Like they're seeing themselves as the steward forever.

Zack: A big commitment.

George: And that's an enormous commitment. Because, you know, technolog-

ical changes, that means they're going to migrate stuff in perpetuity, managing and resources, whether that's staff, storage capacity, all of these things. So when we came to put down the grant proposal for the second [consortium] grant, they came on board. And it was right after, it was right in the context of these running conversations around data management. And the decision that was being made, both, I think, federally, but also within the university and provincially, is to start putting money into supporting these things. And the one thing we get caught on was, caught up in was they kind of like suddenly came back at us and said, why are you talking with Portage? We want to do this.

Zack: Well [unclear].

George: I remember saying, but we've been begging you for years. And they said, okay, well, let's change. And it's like, damn we're broke.

Zack: [this university] is always special and it's not part of Portage. And it's like, they have a weird–

George: But it was kind of like, was like they had and [unclear] they said [unclear], you know, I mean I'm speaking openly here. It was sort of like, you know, don't go with the national group. This is a huge– we've now made this commitment. We've crossed this bridge, we're on board.

Zack: The usual commitments at [redacted], specifically.

George: This was [redacted].

Zack: Not [the region] or the like, okay.

George: No no, this was all of the that we're having conversations now. I mean, the other ones were happening in [another city]. But now it was also in the [university] libraries. And they put, I mean, I would say probably hundreds of thousands of dollars worth of–

Zack: Wow.

Zack: Do you think it had to do with the collaboration or potential collaboration with the environmental studies people?

George: Not necessarily. I mean, I, no. I think it was more that they were, we were, the timing was right, that they were starting to make a really major commitment, investment towards these kinds of things. And they were ready now to take on the [consortium] project as a sort of a test case in that exercise.

Zack: This is a big deal in [unclear] too.

George: And so they're also, so the managing side of it is dealing with meta, like the, you know, the DOIs and all this stuff, trying too–

Zack: Paying for all of them.

George: Yeah. So that process is now is very, very early, but they started. Again, Barry is our point person with [redacted], who's the point person on the library side, to start building the– because we've identified within the larger [consortium] data, smaller discrete data sets or project data sets that we'll use as a kind of template to start building this. And, but the idea is that, I mean my understanding is that we're, eventually all of the [consortium] stuff will go into that environment and they will steward it going forward. And that's huge, I think. I don't know of any project, at least in a Near Eastern context, whether it's European, American, Canadian, whatever, that has that kind of hard, you know, physical infrastructural, institutional support.

Zack: Yeah.

George: So you see, it's permanent.

C64 **Barry:** Yeah. This is another part of my job, is I'm dealing with a lot of that stuff, too.

Zack: Yeah. The application stuff.

Barry: Well, less the application stuff but more the umm, some the of the, interactions with with institutions like [the federal funding agency] and other people like that. So I've done like a lot of meetings, [unclear] of the [funding agency] meetings, and sort of we've been integral to the development of some of their stuff going forward. Meetings with the library about the data storage and coming up with plans with them. And you know–

Zack: You're the point man.

Barry: Eh, kind of. Jack of all trades, master of none.

C65 **Leonard:** But as often happens, we were just tracking the development of the database technology and trying our best to find an efficient way to implement this innovative data model. And it turns out, the great breakthrough was in 1998 the Worldwide Web Consortium, which was founded by George Berners-Lee and had a career that created HTML and you know, like all the standard, the web standards, HTTP, HTML, that the World Wide Web Consortium, in response to the concern of a large community of computer scientists and software engineers, created the XML standard, which was published in February 1998. And the XML standard, which is based on on non relational database theory, was a ver– was a kind of a graph database model that was thought to be especially suitable for document data. And so what they did was they leveraged the markup model, right. So markup was used already in early word

processors that goes into the 1960s. And so the idea was they had to have a way of exchanging complexly structured data on the web via HTTP, meaning using plain text with tags. And so they looked at SGML, which was an earlier version. of–Remember, that HTML as a markup standard was originally just an application profile of SGML. So HTML is a particular set of tags that conform to the grammar of SGML. And so XML was just SGML for the web, right? XML is just a way of taking what was best out of the– XML is that way of thinking what was best out of SGML, which is a kind of grammar that defines the allowable structure of tag sets– remembering an HTML is just a tag set, HTML is not a language. So it's a misnomer that HTML is an application of SGML. And then as you know, XHTML is the XML specification of HTML. But we, now SGML is dead and everything is based on XML. So we forget that history. But yes, for us it was a rev– because I was tracking this, and I still remember vividly in the winter of 1998 I read the spec for XML. I said hallelujah because it conformed very closely to our data model, right. In effect, we had already implemented a hierarchical data model which involved overlapping hierarchies with cross hierarchy links, and that's the essence of the XML data model. And so it was very easy to convert our table structures to XML schemas. And that's what I did around that time, 1999, 2000, I converted to umm, the table structures that had evolved through practice and had been tested in the INFRA system to XML documents. The idea is schemas, an XML schema, is a specification for the allowable structure, you know, elements attributes and nesting, of a given set of marked up documents. And so we were able to convert basically each sort of semantic category of hierarchically organized data that had already been pioneered in using relational tables much more efficiently into this XML structure. And of course, the idea being that we wanted to create an online system, like this is OCHRE, an online cultural heritage research environment that from the get go starting around 1999, 2000, which is when it really switched over to that, was going to leverage the industry, the now industry standard protocols of XML, XML schema and then eventually XQuery, XML querying language, to leverage those to express the exact same data model we'd always been working, already been working with for 10 years, right. So, this is just to illustrate the point that the abstract design of a computational system allows implementation in many different logical data structures and the choice of the logical data structures, whether it's relational tables or whether it's XML documents, whether it's SQL queries or XQueries, you know. This

decision I think depends on engineer– questions of how efficiently and how well has, have those logical structures been supported in the commercially available, you know, robust, well-tested high performance database management systems.
Zack: Yeah.
Leonard: And so this is why we adopted Tamino. You might have heard about that, Software AG, the German, the very innovative German database company, which way back in the early days came up with ADABAS, I don't know if you know, that's a non relational database.
Zack: Amelie mentioned it, but she didn't
Leonard: Natural, I mean, they had a querying language called Natural. I mean, this was back in the 70s and 80s. You know, there was, Software AG had a long tradition of this. They very quickly moved very early into building an enterprise class, non relational XML based database management system that used XML schema to define the structure. So in other words, they're not relational schemas, table schemas or XML documents schemas, and that used the XML querying language to do joints. Because XQuery, the XML querying language, is completely analogous to to SQL. You can do, you know SQL is like select where, you know.
Zack: Yeah.
Leonard: You can understand that, but you can do table joints. Well you could do an analysis, analysis. You can do document joints in XQuery, right. You can, you can find, you can use key fields embedded. You can specify in your XML documents what are the key fields that are the basis of joins between thousands of documents in order to generate additional new documents just like in the SQL you create too.
Zack: Yeah.
Leonard: So it's exactly analogous design. And XML querying language, XQuery, was under development for several years in the World Wide Web Consortium, umm Tamino, they used even before it was officially ratified as XQuery 1.0, they were using what became almost identical to XQuery 1.0 because they had, they employed people who were on their working group for XQuery.
Zack: And you used it too.
Leonard: And we, no, we were using XQuery before it was actually officially ratified by the W3C, because it was what? But anybody who had, who who understood what XML was trying to do and what, I mean, we could immediately see in 1998, here's the possible. Because there's XML, there's XML schema,

there's XQuery. It all makes perfect sense. Because some very smart computer scientists who are database theorists had realized here's an alternative. And I'm not saying it's useful for all applications, because for many, many commercial business related applications, you're much better off using relational tables, which we learned already back in the early 80s. You know, we used ourselves a lot. And I love relational, but but what we're talking about hierarchically organized, semi-structured, sparse data in which the hierarchies themselves can very powerfully convey semantic relationships of spatial containment, temporal sequencing, taxonomic subordination, the discourse, the linguistic and ethnographic structure of texts, then you can leverage, you get a lot of semantic bang for the buck.

C66 Leonard: So all I'm saying is, you know, setting aside unpredictable sci-fi apocalyptic scenarios, it seems to me very reasonable. And I say, both in terms of being financially affordable and institutionally supportable, that that digital media, digital data will be more accessible and better preserved than printed books, and of course will be far more complete and comprehensive than the ones in the libraries. Because the archeological information, data that's in our printed books, in our libraries, even like [our university library] or, you know, huge university libraries have almost everything that was published by the ordinary press or the Library of Congress, what have you. I've already said, well, because of the limitations of the print medium, that's already just a fraction of what we would really want to have preserved. And so not only will you get a much more complete preservation, but you also get as reliable, if not more reliable, long term preservation in digital format. Even though the digital does seem ephemeral, the point is you have institutions like university libraries. I mean, I mean, non profit charitable organizations like a University– [our university] is a private institution, [our partner's university] is public, but in either case, organizations that have a long term mission to preserve knowledge and a long term funding model, either through government support or through an endowment like this university has. And so you could say, the money will be there because it's a core part of the mission of the university. And you can't imagine any scholar of the future saying, no, we don't want this information. So I think, I think that's the big picture here. I mean, and the question has been in the last 20 years how to make it work as an engineering matter. But the bigger question of can it work, I think it's easily answered. And that's

what, you know, then the devil's in the details of engineering systems and using standards and protocols that can allow it. And of course, the great advantage of both XML, of all the web technologies, so of all the data formats, digital data formats standardized by the world wide web, the World Wide Web Consortium. The point is they're open, non-proprietary, public and based on plain text. So that umm, and that's, of course, what makes them, uhh the data so easily transferable from one op– from very diff– among very different operating systems on the web, because ulGeorgeately the data is encoded, according to uhh ASCII or Unicode standard. So as long as nobody ever forgets what is the binary level specification in bits and bytes of Unicode, you see what I'm saying?

Zack: Yeah, there's there's layers [unclear].

Leonard: The point is that people. So. So from an engineering point of view, this was all settled in the 90s. And then after that– Because in the 90s you had HTTP, by the late nineties, but the end of the nineties you had XML, you had Unicode, you had all of those mechanisms that abstracted away from, is it some commercial operating system that might go belly up like Windows or OS 10 or whatever? You're not, you're not, and you're not and you're not dependent on Linux either. You're not dependent on the particular operating system and what what it assumes the format will be. You have this umm, this independent umm, digital encoding format umm that is in principle umm, you know, eternal. Or not eternal, but is, it is is independent of the whims of the capitalist marketplace and whether companies go out of business and what you. have In the same way that we have most of our books in our libraries are printed with the Latin alphabet, which is not an undeciphered script. If it was all printed in Cypro-Minoan or Linear A, we might have a problem.

C67 **Ned:** I also worked at [a particular site]. Early 2019. And that's, that's an [locally-sponsored] project. So they needed a database. So we got them using [our database]. But they also use paper in the field. They're probably not going to be using computers in the field also. It's, umm [that site] is very sandy and dusty, and computers I think would die. They, granted there were only like two of us excavating and they were older people. They're not going to really be using a database. So I was doing all of the data entry from the papers, but I standardi– I standardized it so that umm it's really easy to just transfer the information from one format to the other. But umm, what was really cool there is that one day my director sat down and he cracked open a giant ledger, and he

had an object in front of him. And then he started writing details about that object. And I said what are you doing? And he says, you know, I'm creating the object register. And I'm like, but you don't need to, it's in the database already. I described it. I measured it. I linked it. It's in the proper bucket, in proper unit, in the proper place in the hierarchy. You know, we know where it is, we know our came from, we know the measurements, what it looks like. You don't need to write it down, that's double the work. And he said, oh really? Oh, great. Closed the ledger, didn't write another word in it for the rest of the season. And then at the end, the umm, the, the representatives from the [national museum], they chose a selection of objects to be stored at the museum, umm because you know they only want the best stuff, they don't care about the pottery and stuff. So I, they gave me a list, I selected those items in [the database], and I was able to just generate a table with all of the photographs and export it to Excel and then print it out for them, and it was very, very simple. So, you know, even though they didn't use the database actively, after– afterwards, you know, towards the end they saw it saw its value, you know, where it can, it can be a good replacement for the paper recording system.

C68 Paul: And so in terms of long term, yeah, there's, there are a number of strategies that we have implemented and actively recommend to people. I mean, we don't really just recommend that people record their information, that we just leave it there. And that doesn't do anybody any good, you know. Should ideally get it out to the world somehow. So whether that's published on a website using the [database] API or whether it's sharing their open data sets using semantic web tools or whatever you want to do, I mean [our database] supports all of that.

C69 George: And each of the leads in those units are responsible for entering the stuff directly into [the database] in the field. Although when we say in the field, we rarely do electronic. This is, this is an important point. Some projects are trying to sit there with their computers out in the square, as it were, you know, like typing it straight in. We still felt very strongly that we needed to work from a hard, to do a field copy, and then– back at the site. Because it enters a kind of redundancy that we think is still important. It's not because we don't understand it–

Zack: What is it important?

George: We don't accept digital and so on.

Zack: And why do you think that's important?

George: There's a number of things in my view, and these are things we have to keep revisiting. So as technology and as things change it's possible that some of the reasons become less relevant or viable. One of the core ones for me is, I still think that that plays a role in how we understand, in our own mind, what we're dealing with.

Zack: Yeah.

George: Umm to process having that stuff through our own brain, as it were, I think has a huge impact on our ability to understand and also to make decisions, judgments and assessments about stuff in the field, particularly in a site like [my site] that has very complex stratigraphy and very grayed and grayscaled details on things like, you know, whether this is a floor or a pit or not a pit. It's it's very, the data is very ambiguous. It's not stark black and white. And so you're making very greyscale kind of judgments about material. So I think it's really important to internalise that and to process that rather than to sit there and immediately type it in. Because I think when you put it in a computer it sort of almost bypasses your internalizing. That's actually something that I believe in. Others may not agree with me on that. But that's one reason.

C70 **Barry:** From what I understand, when it comes to a lot of it, the greater understanding of the stratigraphic relationships, a lot of it's in Mitchell's head.

Zack: Oh, okay.

Barry: And hard. it's You know, you have to really sort of sit down and get it out of him.

Zack: Have you talked with him, like–

Barry: Not my job. Haha. It's Cayleb's job. And yeah, he has talked with him, he has been in conversation with him, but also, I believe, uhh, I think it's becoming harder and harder now. I think maybe Mitchell is not remembering things as well.

Zack: That's why you write things down.

Barry: Yeah. And this is, this is a huge problem with archaeology. A lot of people, it's just in their heads.

Zack: Yeah, yeah.

Barry: And uhh, when it comes to either the successors or even when you're trying to publish it yourself–

Zack: That's kind of the main reason why I'm doing my research. Because it's

about communication. How do you compare the two people's heads through a medium, documentation?

Barry: Yeah.

Zack: Right, that's the key.

Barry: Oh, his documentation for the site is a little, well. Like Cayleb, Cayleb has his work cut out for him. But he'll, I think he'll be able to pull it off.

Zack: Yeah, yeah.

Barry: Because he again, because he had done enough exca–, a couple of years of excavation on his own. He did some step-trench. You know, he at least has a general feel for where things are, and he's getting in long conversations with Mitchell about stuff in the field, and [unclear].

Zack: So this obviously requires lots of like personal understanding, right? And being there, sort of. And then just being able to with socialise people for decades, essentially. So you obviously know each contributor prepare well, right.

Barry: Decently, yeah.

C71 **Barry:** One of the best early examples I can give you of this is– did you ever know Charlie? Do do you know the name, at least?

Zack: Yeah.

Barry: So he was a–

Zack: I know the name.

Barry: He was a prof at, in [our department], he was the– George replaced him, essentially.

Zack: Okay.

Barry: And he was working on the publication of the [major and historically significant] project.

Zack: Yeah.

Barry: He passed away. Howard has taken up that thing. But he had the idea that, the way he wanted to publish it was that he was he was, you know, scanning everything, everything was going digital. This was like way before [the consortium], you know, this was, 20 years ago. And he was putting everything out there. Scans of notebooks, the, you the know, field notes, and digital field notes and stuff like that. And when word got out, it actually created a bit of a fuss amongst all the archaeologists who worked on the, at the [redacted] project. And we're talking big name people in Near Eastern archaeology. And

there was actually even talk of like a court injunction to stop him from putting that stuff on because they didn't want to have their field notes from when they were graduate students put out for–

Zack: It is an odd thing. Because whether that's data or not. You know, what's, data is useful information. Is data, is information that's used, structured, or, so it can be data.

Barry: Yeah.

Zack: The distinction between data and information systems is blurry, in my view.

C72 **Zack:** Do they have to have field experience?

Howard: Not necessarily, no. I mean, some of them have only taken courses or taken the lab course through anthro.

Zack: Yeah.

Howard: Or some maybe courses here. But at least they have some of the, the concepts are understood.

Zack: Yeah.

Howard: And some of the terminology that appears in the field records and the locus sheets and things like that. They, you know, they know what abutt means, they know what contiguous means. So, these kind of things, when you're reading the field notes, they're not, you know, constantly running to me and asking questions. So they really got an idea of what, you know, what is in the notes.

Zack: Are there limits, do you think, that that they would only be able to sort of really get through field, the experience that people wouldn't get otherwise either? Are their any distinctions between students who have full experience and those who don't?

Howard: No, not necessarily. I think I think I mean, I've had, haha I shouldn't say this, but I've had some students with more field experience or more training who basically come with with certain assumptions which may or may not be correct. And often those that have just a bit of experience ask the right questions. They don't, they don't do things and then realise, or we realise later that they've done incorrectly because they've made assumptions or assumed they knew exactly what was going on without asking questions. So there's sort of, there's a fine balance. I mean, I, also depends on the individual. I mean, I'm not I'm not trying to out any specific person.

Zack: Can me an you give example, without naming names?

Howard: Yeah. Well, I think basically that the example would be where they've actually looked at some of the material and just made assumptions that they've interpreted it in the correct way, where I come back and say, no, that's not at all how the field notes are really about.

Zack: Can particular you tell me about a example of when that happened, what kind of interpretation they made, and...

Howard: I think probably based on stratigraphy. I mean, went they're looking at, they may read the notes and they're– I mean, we're not cutting and pasting out of the notes. You know, sometimes it's more of a, you know, I mean, not really a translation of, but I mean, we can't– so much is written in the narrative in some of the field– in the diaries and the notebooks and things like that. So there's, they're pulling from that. But I think they've, again, thinking they have a really good idea or, you know, they have a full grasp of exactly what an archaeologist is and exactly how, you know, they've got it all figured out. Anyway.

Zack: Yeah.

Howard: And then when they when they throw it in, I know they put in the database or something, and I realise like, no, that's not at all what was saying. it I mean, those who are more cautious and ask questions tend to get it more accurate. I mean, there's so some cases, I mean again, it's very, very few. It's seldom happened. But that is the case where there are, you know, there has been, you know, certain individuals who are not asking questions when they need to.

Zack: This is pertaining to the, entering data for Tayinat, right?

Howard: That and, that and other things, yeah. Yeah. Largely for, yeah, entering the Tayinat data.

C73 **Zack:** But can you give me an example of what you did last week?

Paul: Yeah. So consulting with ongoing projects is sort of the most general way I can say it. So typically what we'll do is we'll have a regular schedule in our office for when grad students or post-docs who are embedded with projects will work in our office. So they can ask questions and consult with us in real time as they're doing their work on the other computers. They are in there, they can just turn around and say, would you do it this way, or how would you do it? So it's a really helpful way for them to do that.

Zack: This is when they're doing data entry? Or [unclear] doing schema documentation, or...?

Paul: Almost always data curation or data entry, yeah. Actually just like inputting data or tagging it with metadata or you know data, doing thing. that sort of, so checking there's a number of those people who will be on sort of a regular rotating schedule in our office. Umm, some examples. There is the [redacted] project, which is [redacted]. So that's a project that's working with [a wide variety of texts], and demonstrating that the same digital tools can be used to analyze text and all those different corpora. So people from [that project] will come to our office, they'll work on their Greek [unclear] texts, for example, and you we'll know, discuss problems with you know, modelling these crazy Greek texts with all of their strange punctuation. You know, they're sort of late, so, you know, you get weird all these scribal notations and so we'll have to sort of stop, put our heads together and say, what would be the right way to record this in the database? You know, and then if needed, I'll sort of update the taxonomy so they have the tools that they need to [enter data]. So that's one type of project. Some other examples are we have a few projects who are using [our database] to salvage legacy data. So, for example, we have an anthropologist from [our university] here who for many years excavated in Bolivia, and had his data in a database that just was sort of a dead end for him. He couldn't use it, it wasn't useful, he wanted to put the data online to share with his colleagues. So of course over the last couple of quarters, his post-doc maybe, or just hired staff person has been embedded in our office working with us to rescue his legacy data so that we can publish it online. And so a month or so ago, we got to the point where we publish his legacy data online. And so now we're at a place where we're like okay, well, we've got this baseline amount of data published online, let's supplementing it with other data. So his staff person, you know, comes to our office and say, okay, here is the next round of information that we'd like to put in the database. Let's figure out the best way to do that and we instruct him on how to do that. And, you know, he can work away on that on his own. The other sort of main, not main, the others are side things actually when you say it that way, is that there's a photography lab in the building here for the [redacted] Project, and I'm basically managed the workings of that photography lab.

C74 Zack: Yeah. Are they all collaborators, all these thirty thousand sites, that

people excavated?

George: Umm.

Zack: I'm just, that's a hypothetical question.

George: I don't think that they're collaborators in that sense. But, but I mean, it wouldn't, you wouldn't call a per– like if you write a paper and you cite somebody and you, you know, you have it in parentheses in the text and in a bibliographic reference at the end, that doesn't make them a collaborator, just because you cited them.

Zack: Well, why not? I'm just, I'm asking hypothetical question, but like it's–

George: But you're citing, at least, them as a source for that information.

Zack: Yeah, yeah.

George: That's pretty simple. But in the case of where you are constantly aggregating more and more and more data, I think it does become difficult, and somewhat, you know, there's some doubt in my mind that we're adequate– that were accurately and adequately tracking all of those sources.

Zack: Yeah. Umm.

George: You know, I saw, a recent example, we were just talking about this, let me see if I can find it here quickly. Where is this thing?

Zack: It's ten to seven, just letting you know.

George: Yeah. I think I'll need to call it a day soon.

Zack: Yeah.

George: So this was a group that sort of jumped the gun on the [redacted project name], sort of stole a little bit of the thunder of the [redacted] project. But it was done by some people who basically just did a survey of about, I think it was around 250 different archaeologists. They put out this survey, they call it the [redacted] Project, and this was published in [redacted journal] back in [redacted month and year]. And they polled all these different archaeologists around the world. And then they started drawing basic patterns about land use over the last, I don't know, I think the last eight or ten thousand years.

Zack: Polling them for what information though?

George: Polling it from the surveyed information that they got back from these archaeologists.

Zack: About what though?

George: I didn't participate in it. So, I heard about it, but I didn't participate in it. So I don't know. I didn't see the survey. I don't know what questions they asked.

Zack: Yeah.

George: But it's a survey.

Zack: Yeah.

George: And then they were able to start doing that.

Zack: Archaeologists know land, I mean that's–

George: Yeah, they mapped this kind of stuff. But there's a lot of questions about the quality of their stuff. But what I wanted to point out is this, so this is this, this is the title, the authorship of this article. I mean the lead guy is [redacted]. But look, I mean it's fine but–

Zack: It's a different disciplinary mindset.

C75 **Barry:** You know, the case of Norman and umm, and [redacted project name]. He still hadn't fully accessed all of that data. They they they gave us the Neolithic data because they were working on the publication.

Zack: Yeah.

Barry: And uhh, the other phases, while they were, or they couldn't do it because you know, they handed it off people for PhD projects or something like that. Or they don't have access to the notes, or in the case of, a lot of the stuff actually is in Australia. That's why we have Sydney as sort of a, a partner as well. And there's another example where all the data is in umm, sorry, that's not [this project]. But uhh, umm, but uhh. Anyway, uhh, Mac has his his like all in his head. But Mac worked on the [redacted project] stuff for his dissertation. And his adviser was one. So he's the one we've been sort of interfacing with. He's got a lot of that data in his head as well. And so we've got Neolithic stuff, the– but nobody was, we, yeah, they were not willing to give us the rest of the data because nobody had ever gone through and created a good stratigraphy for the site. And so they didn't, I don't know whether it's they were embarrased or they just didn't feel right sending that data until the comprehensive stratigraphy had been done. And so with that, we ended up sending money to umm, to [redacted], who was Mac's graduate student, who did her MA on, or sorry, her PhD on the MB levels at [the project]. And so she had constructed a stratigraphy for one of the main sections. And so we helped give her money to work on the other areas of interpolating the [unclear] so that we could actually, like–

Zack: So it made it easier to–

Barry: And that still hasn't happened, actually. This is one of the questions

that came up just the other day in our meeting, was like what's the status of that? That's true, I completely lost track of that. So, you know, I contacted–

Zack: How long ago was this PhD thesis?

Barry: Uhh, three years ago. But she then, she had a child so that threw, threw a wrench into things for a year. But I just, I contacted Susan because she was doing, [redacted] was doing it in [Susan's university]. And so she, and she said no, she actually just heard from [redacted] earlier that week and she, yeah, she is, she does have a job, she's working in [redacted university], I think it is. And uhh, but she is still working on the strtigraphy for [the project]. So in theory, that is coming soon. And then we'll be able to get parts of the data. So like–

Zack: Are of there sort fundamental things that you need to have before you, before you–

Barry: Yes. But you know, they they should be able to send us, you know, the photos, the, you know, scanning these photos, scanning, scanning the notes, send it, send it to us now, because [that will] help you in the long run with the publication, and let us get access to this stuff now rather than having to wait and then get it dumped on us.

Zack: It's a well not a goal goal– post, it's a, like a, you know, a crossroads sign, you know. A sign post, I'm trying to say.

Barry: And there's just this, this hesitation from from the, from the [redacted project] people that I– I don't fully understand why they won't, won't share with us. But it's, so like, we're a good community but there's still some stuff that we're not, you know, the data isn't freely flowing.

C76 **Barry:** You know, with a lot of archaeological research, you don't post the primary data until you're satisfied with your publication.

C77 **Paul:** Well I mean to the extent that any sub-project is its own project, it can be as private or as sharing as it wants to be. I mean, the idea is that they're going to have some sort of agreement with [the consortium]. I mean, they want to be a partner so there's be going to some level of sharing. But that doesn't mean it has to be, you know, a complete open book, and they'll have their own [database] project and can assign their own users. So there is that ability to sort of stay autonomous.

Zack: Yeah, that's true.

Paul: I think that's what George would say is good.

Zack: Yeah.

Paul: Like [the consortium]'s not to say, ours.