Social Science and the Naturalization of Social Metaphysics: Old Biases and New Advances

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Abstract: Some philosophers challenge the advisability of naturalizing social metaphysics by appeal to social science. They argue that social science fails to meet criteria for realist commitment, such as unity and novel predictive power, and that social science would therefore be a poor basis for naturalization. These skeptical challenges are rooted in traditions in the philosophy of science that have held the social sciences in poor esteem. Through a case study that highlights the ways in which archaeology is methodologically converging on hard science, I show that the philosophical bias against social science is outmoded. I suggest that at least some of the methodological advances of archaeology and other social sciences are epistemologically significant and are relevant to the question of realism. However, I conclude with the thought that realist commitment need not be a precondition for naturalization. The paper therefore accomplishes two main things: (1) it allays objections to using social science to naturalize social metaphysics, and (2) it motivates a higher estimation of the epistemological credentials of social science as compared with more skeptical traditions.

Keywords: naturalized metaphysics, social ontology, naturalizing social ontology, scientific realism, scientific practice, archaeology

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1. INTRODUCTION

There has been a renewal of interest in the epistemological credentials of metaphysics, spurred in part by Ladyman and Ross' call to replace neoscholastic metaphysics with *naturalized metaphysics*. They understand naturalized metaphysics to consist in the unification of science, with primacy given to fundamental physics (Ladyman et al., 2007). Others have voiced similarly critical sentiments and urged that metaphysics make greater contact with science.[1] Some have aimed to temper the scientistic flavour of such views and to preserve the autonomy of metaphysics, while still using science to reign in its speculative excesses (Morganti, 2013; Tahko and Morganti, 2017). Philosophers such as Maddy (2007) have made a case to bring philosophy more broadly into closer proximity with science. The unifying theme among these positions is the idea that science is a distinguished form of objective inquiry and a better guide to reality than isolated armchair speculation.

The focus of naturalistic programmes has largely been on how natural science, particularly physics, can inform inquiries into the underlying nature of reality, including its constituents and the hierarchical structuring relations among them. However, there has been some discussion of the prospect of naturalizing *social* metaphysics—the metaphysics of the social realm, which investigates the nature of social objects (such as currencies and corporations), facts (such as facts concerning social permissions or restrictions), properties and relations (such as privilege and power), and kinds (such as races and genders).[2]

Naturalized metaphysics is characterized in several ways. I favour a broad conception of it, in which metaphysicians do *naturalized metaphysics* when they conscientiously engage with the data, theories, theoretical interpretations, and/or practices of science. On this approach, science *constrains* the metaphysics. This means science forecloses certain theoretical avenues or options (by being inconsistent with them) and pushes the inquirer toward others (by evidentially supporting them). Engagement can mean many things: unifying science, deriving consequences from it, reasoning abductively from it, interpreting it, using it to guide which metaphysical questions we think are presently worthwhile or tractable, and so on.

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1 Bryant (2020), Maudlin (2007), Maclaurin and Dyke (2012), Melnyk (2013), Ney (2012)

2 Kincaid (1996) was an early proponent of naturalizing social inquiry. See also Guala (2007), Hawley (2018), Khalifa and Lauer (2021), Lauer and Khalifa (2023), Lohse (2017), Saunders (2020), Scholz (2018), Thomasson (2003).

By extension, *naturalized social metaphysics* involves conscientiously using science to constrain metaphysical theorizing about the social world. This does not mean that science resolves or even bears on every possible question of interest in social metaphysics. Nor does it eliminate the need for abstract, armchair, or conceptual work. It simply means that, to the extent that science does bear on some of the questions at issue, our treatment of those questions is appropriately constrained by it. This is an intentionally inclusive characterization. I take that to be a strength of the characterization, because there is not one right or fruitful way of doing naturalized metaphysics, social or otherwise.

From a certain point of view, the relevance of science—broadly understood—to social metaphysics is clear. Human beings, human minds, and human societies are part of the natural world that is the object of scientific study (Kincaid 1996, xv). Moreover, science concerns itself with some of the very same social entities, properties, and structures that are of interest to social metaphysicians. Examples of the relevance of science to social metaphysics abound. Psychology can illuminate how biases and heuristics, cognitive architecture, political irrationality and other features of individual and group psychology shape social phenomena. Neuroscience can reveal the neurological roots of those mental phenomena. Sociology and anthropology can identify social categories, study social significance, and unmask ideologies. Political science and economics can reveal facts about the nature of political and economic institutions and illuminate group behaviours, dynamics, and decision making. Linguistics can illuminate the interplay between language and social categories. Population biology and genetics can reveal the extent to which social categories track biological kinds. The list goes on, and it can grow in unpredictable ways as science and social metaphysics progress.

However, some commentators have pointed out that, notwithstanding the apparent relevance of science to social metaphysics, much social metaphysics is detached from science. Guala remarks, "[u]nfortunately, little evidence of [the empirical] sort is used or even mentioned in current work on social ontology" (Guala 2007, 968). Similarly, Saunders comments that much of social metaphysics has been "largely dissociated from actual social science, a complaint that has been raised by several writers" (Saunders 2020, 140). In more applied matters, Khalifa and Lauer argue that certain anti-realists about race have proceeded "without engaging social science. Indeed, the few antirealists about race who engage social science focus entirely on *theoretical* social science" (Khalifa and Lauer 2021, 1). Likewise, Spencer suggests that:

> [P]hilosophers of race have, for the most part, rejected the claim that these new population-genetic results overturn the received view of biological racial anti-realism, and they have defended the received view using three philosophical routes: semantics, metaphysics, and methodology. (Spencer 2015, 47)

Moreover, some social metaphysicians explicitly argue that certain features of the social world—such as its proximity to the manifest image—licence non-naturalistic approaches to social metaphysics (Baker, 2019; Hawley, 2018).

Nevertheless, some philosophers are working to integrate science into social metaphysics.[3] So, the issue is not whether and why social ontology should be naturalized but whether and why it should be *further* naturalized—that is, whether and why already existing naturalistic approaches to social ontology are advisable and indeed preferable to non-naturalistic ones. In response to this question, two camps have emerged: proponents of naturalization (Khalifa and Lauer, 2021; Kincaid, 1996; Guala, 2007; Lauer and Khalifa, 2023; Saunders, 2020; Scholz, 2018) and skeptics, who challenge its feasibility (Lohse, 2017) and rationale (Hawley, 2018).

In this paper, I will address one of the broader reasons for skepticism about the prospects of a naturalized social metaphysics. After some preliminary remarks (Section 2), I will discuss a longstanding bias among philosophers of science against social science (Section 3), which I will argue does not reflect ongoing methodological trends that bring social science ever closer to natural science. I will outline those trends in a detailed case study of recent archaeological practice (Section 4). I will then discuss the philosophical import of the case study (Section 5). I will suggest that shifting social science methods bear on the epistemic credentials of the social sciences, as well as the question of realism (i.e. the question of approximate truth). At the same time, I will consider the possibility that full-fledged realism may not be a prerequisite of naturalism.

2. PRELIMINARIES

Some preliminary points are in order. First, it may be tempting to assume that if social metaphysics is going to be indexed to science, it ought to be indexed to social science, since *social science* is most obviously relevant to the phenomena of interest to social metaphysicians. However, a picture of the

3 Such as Barnes (2021), Khalidi (2013), Khalifa and Lauer (2021), Kincaid (2016, 2018, 2024), Lauer and Khalifa (2023), Spencer (2014, 2015).

naturalization of metaphysics according to which natural science is a guide to natural reality, and social science is a guide to social reality, is unnecessarily limiting. Even if the boundaries between social and natural reality and between social science and natural science were clear, it would be best to be open to many potential avenues of cross-pollination. We know that social science is relevant to non-social philosophy. For instance, psychology clearly informs philosophy of mind. Moreover, we should expect natural science to be relevant to social philosophy. For instance, biology plausibly bears on questions of race (Barnes, 2021; Spencer, 2014, 2015) and gender (Nelson, 2017).[4] Nevertheless, I will focus on the credentials of social science in particular, because some have argued that it is especially ill-equipped to guide social metaphysics.[5]

The second preliminary point acknowledges the difficulty of drawing firm distinctions between the various categories I will invoke in this paper. One might think that the coherence of the naturalist paradigm hangs on ill-fated demarcation projects. In particular, if one is going to claim that science should guide metaphysics, then arguably one needs a precise sense of what distinguishes them in the first place. Similarly, one might think that in order to discuss the relations among natural science, social science, social metaphysics, non-social metaphysics, the natural world and the social world, one needs a precise sense of the contours of those categories. But the categories are vague and the boundaries between them frequently opaque, such that one might take the relevant line-drawing projects to be intractable. Nevertheless, we can talk about the relations among these categories while at the same time recognizing the vague boundaries among them. For my purposes, conventional disciplinary boundaries give us an adequately rough-and-ready sense of the categories at issue.

A further point concerns the paper's grain of analysis. One might object to my discussing the methods of the social sciences in broad strokes. The social sciences are heterogeneous in epistemologically relevant respects, since social scientists implement a range of methods. Nevertheless, to the extent that philosophers of science indict the epistemological credentials of the social sciences *tout court*, they fix the terms of the debate at a certain level of generality.

4 This is not to say that biology fully fixes answers to those questions. Nor do I mean to support reductionism or essentialism. I just mean to say, minimally, that biological facts plausibly have some relevance to those domains. The extent of their import is, of course, an open and hotly contested question.

5 While my overarching interest is in the potential of social science to enable naturalized social metaphysics, arguably naturalistic metaphysics could in some fashion support successful social science (Ross, 2023).

It is therefore appropriate to respond in those same terms (while cautiously avoiding unqualified generalizations and conscientiously attending to concrete examples).

My final preliminary point is that, while my argument will defend the scientific credentials of social science by highlighting the ways in which it is increasingly like natural science, by no means do I wish to concede that the methods of natural science must always set the standard for rigorous social science. Social science may make distinctive contributions to scientific knowledge in virtue of certain *sui generis* features. It would be worth exploring those features independently and developing a more nuanced view of scientific rigour. However, I will not develop such a view here. For the purposes of this paper, I will assume that employing the methods of the natural sciences in suitable contexts is one way to be scientifically rigorous, potentially among others. With those preliminaries out of the way, I will now consider how a broad philosophical tradition of social science skepticism might lead one to deny that social science is a suitable basis for social metaphysics.

3. PHILOSOPHICAL ROOTS OF SOCIAL SCIENCE SKEPTICISM

Naturalists tend to think that our best metaphysics should be based on our best science. Often, *best science* is construed in realist terms, as mature and novelly predictive. It might be tempting to think that if social science did not meet these realist criteria, it would be unclear why we should index social metaphysics to it. For instance, Hawley argues that social science is too disunified and inadequately predictive to contribute to a successful naturalized social metaphysics (Hawley 2018, 190-92).

This skepticism is far from atypical. Rather, it is rooted in broader philosophical traditions that regard social science dubiously, as second-rate science—not just in the sense of being epistemologically inferior to physics but in the sense of having generally meagre or inadequate epistemological credentials. In particular, Hawley's focus on unity and maturity appears to be rooted in Kuhn's philosophy of science. In Kuhn's view, sciences go through a phase of prehistory marked by fundamental disagreement before they reach maturity, which is characterized by the adoption of a paradigm (Kuhn 1962, 12). Periods of scientific prehistory were seen in "the study of motion before Aristotle and of statics before Archimedes, the study of heat before Black, of chemistry before Boyle and Boerhaave, and of historical geology before Hutton" (Kuhn 1962, 15). Regarding social science, Kuhn remarks:

> I was struck by the number and extent of the overt disagreements between social scientists about the nature of legitimate scientific problems and methods. Both history and acquaintance made me doubt that practitioners of the natural sciences possess firmer or more permanent answers to such questions than their colleagues in social science. Yet, somehow, the practice of astronomy, physics, chemistry, or biology normally fails to evoke the controversies over fundamentals that today often seem endemic among, say, psychologists or sociologists. (Kuhn 1962, xlii)

This observation leads him to say "it remains an open question what parts of social science have yet acquired such paradigms at all" (Kuhn 1962, 15). The suggestion is that some or most of social science is too bogged down in fundamental disagreements to have a consensus paradigm and thus to be considered mature.

Hawley's invocation of realist criteria signals a second historical root of social science dismissal: the scientific realism debate. The terms of the debate have been characterized in many ways, but, for the purposes of this paper, I understand *realism* to be the belief that our best current science is approximately true (which is sometimes taken to require that its central terms refer). Realists often focus their arguments on the remarkable successes of physics. But the metrics by which physics is judged successful tend to be ones which social science performs comparatively less well on. For instance, Kincaid summarizes some of the arguments for anti-realism about social science (arguments which he criticizes on a number of grounds) as follows:

> The social sciences are by and large a dismal failure when it comes to prediction and control. This is true despite the fact that unprecedented social research has been conducted in the last half century. What explains this failure? The social sciences do not cut nature at its joints—it describes kinds that are not natural kinds. (Kincaid 2000, 671)

According to such anti-realist arguments, the lack of social scientific prediction and control apparently owes to the non-natural character of its subject matter. The anti-realist conclusion is that we should place little stock in the explanations provided by the social sciences. According to this line of argument, the kinds described by social science are not natural kinds, so our descriptions of them do not enable prediction, and so we do not have adequate reason to think they are true.

This leads to a second and related anti-realist argument, which emphasizes the messiness of the social world (Kincaid 2000, 672). The social world is arguably messy, in that it changes over time (with changes in preferences, institutions, and so forth) and in that "there is frequently no one right answer to the question of what caused what" (Kincaid 2000, 672). According to the argument, since the objects of social scientific study have no single, static and discernible causal structure, it is not clear that social science can provide objective or enduring descriptions of them. Hence, it is not clear that we should regard its generalizations as true.[6]

It is not my aim to address these arguments individually. Rather, my aim is to show that the dismissive attitude they motivate is uncharitable and increasingly outdated. As a corollary, this suggests that some of the premises or implicit assumptions on which these arguments rest should be re-examined. In particular, I would suggest that (1) social science performs better on some of these metrics than previously assumed, (2) our ways of gauging criteria like maturity may need revising (Hibbert, 2016), and (3) criteria such as maturity and novel predictive power should not be treated as the sole arbiters of realist belief or epistemological standing more broadly. I will not make a full case for all of those points here but will instead focus on establishing (1).

At any rate, I find myself echoing Kincaid's sentiment from 25 years ago, in which he remarked on feeling "a growing frustration with my philosophical colleagues who are willing to pronounce entire domains of social inquiry doomed to failure while paying little attention to what social scientists actually do" (Kincaid 1996, xv). At the time, Kincaid argued that "some social research shows that the social sciences sometimes achieve full scientific rigor" (Kincaid 1996, 3). I believe that a close look at what social scientists actually do suggests that social scientific research continues to become steadily more scientifically rigorous. Appreciating this should diminish skeptical doubt regarding the epistemological credentials of social science. In particular, I will argue that the dismissive attitude toward social science overlooks its increasing interdisciplinarity and hybridization, its use of sophisticated scientific instruments, its integration of big data, its adoption of empirical methods, as well as its growing emphasis on mathematical and statistical tools, models, and modes of reasoning that enable greater descriptive

6 As we learn more about fundamental physical, chemical, and biological levels of organization, we find our pictures of them becoming more complex and often more messy. Nevertheless, the levels have discernible causal structures that lend themselves to generalized description. The anti-realist's claim must be that the social world is messier than that—too messy for there to be general social facts discoverable by social science.

precision, predictive power, and empirical testability. We see these trends across the social sciences, but to make matters concrete, I will demonstrate how they manifest in a particular domain of inquiry: archaeology.[7]

Let me be clear about the overarching dialectic. One of the roadblocks to the naturalization of social metaphysics is generalized social science skepticism. My aim is, simply, to remove that roadblock. That is, I intend my case study to undermine generalized social science skepticism. I do not intend it to directly establish the tenability of naturalized social metaphysics. So, the reader might notice that the case study lacks a clearly social import. It is not always clear that the phenomena of interest are social, that social assumptions figure into the methods surveyed, or that the methods produce distinctively social insights, much less ones that bear on social metaphysics. Doubtless those kinds of examples would be indispensable components of a proof of concept for naturalized social metaphysics. But that is not the project I have undertaken here, so those are not the kinds of examples that I need. Since my target is generalized social science skepticism, I simply need examples that speak positively to the epistemic credentials of social science. Such examples do not make a complete case for naturalized social metaphysics; they simply undercut the case against it. With those provisos in mind, let us turn to the case study.

4. SHIFTING METHODS IN THE SOCIAL SCIENCES: A CASE STUDY

4.1. Interaction and Integration

Archaeology has long had a reputation as a "soft science" (Barton 2013, 171). Yet, for decades it has drawn closer to the hard sciences in a number of respects. First, archeological projects and practices frequently exhibit remarkable interdisciplinarity. For instance, consider research projects like the ArchaeoGLOBE Project, a "massively collaborative online platform for the rapid assessment of past human impacts" (Max Planck Institute of Geoanthropology, n.d.). One of the project's studies brought together archaeologists, anthropologists and geographers, who discovered that land use by hunter-gatherers, farmers, and pastoralists initiated significant global transformation, altering patterns of biodiversity and climate far earlier than Earth scientists had previously believed—around 3000 years ago (Stephens et al., 2019). Archeological fieldwork is now highly interdisciplinary, since archaeologists work alongside metalurgists, chemists, and mineralogists in field survey and excavation (Pollard

7 See Currie (2018) for another optimistic take on the epistemic credentials of archaeology, as well as those of the historical sciences more broadly.

and Bray 2007, 248).

One might object that when archaeologists conduct research alongside those who do quantitative and empirical research, it hardly makes archaeology itself more scientific. Yet the lines between disciplines are growing increasingly fuzzy. Archaeology, like other social sciences, is subject to increasing hybridization. As interdisciplinary research creates clear points of contact between archaeology and the natural sciences, subfields emerge that mix the aims and methods of both. Consider, for instance, the development of *archaeogenetics*, which was envisioned as a synthesis of genetics, archaeology, and linguistics requiring collaboration among molecular geneticists, archaeologists, anthropologists, historical linguists and climatologists (Renfrew and Boyle, 2000; Renfrew, 2010).[8] Interdisciplinary fieldwork has also lead to "the joint education of both field archaeologists and laboratory scientists and the rapid advancement of the field of achaeometallurgy" (Pollard and Bray 2007, 248), in which the methods of archaeological survey and chemical analysis are used to examine the past use and production of metals.

Consider also *zooarchaeology*, which uses animal remains to study the history of human-animal relationships. Zooarchaeology integrates concepts, explanations, practices, and knowledge from the fields of anthropology, palaeontology, archaeology, biological anthropology, history, humanities, zoology, ecology, forensic biology, veterinary science, agricultural science, geography, and geology (Reitz and Wing 2008, 1-2). Its practitioners produce empirical studies of "extinctions and changes in zoogeographical distributions, morphological characteristics, population structure, the history of domestication, paleoenvironmental conditions, and ecological relationships of extant fauna using sub-fossil materials to provide historical perspective," together with theoretical perspectives on the human-environment relationship (Reitz and Wing 2008, 2). These sorts of subfields subvert conventional disciplinary boundaries and frustrate reductive methodological and epistemological narratives.

However, one might argue that the boundaries that motivate differing attitudes toward natural science and social science still exist, since we can screen off the natural-scientific bits of archaeology from the theoretical bits. According to this line of thought, notwithstanding greater interaction and collaboration, we can distinguish archaeologists who employ the methods of natural science from those who do not and say they inhabit two fundamentally

8 Granted, some have suggested that archaeogenetics did not turn out to be as "genuinely integrative" as its progenitors apparently hoped (Pluciennik, 2006). However, practices are quickly changing, and this may have improved in more recent years.

distinct worlds. One might then argue that the people employing the methods of natural science are doing natural science. If so, examples of their activities are not relevant to the assessment of social science, and whatever epistemological points they score are not points for social science.

Some archaeologists seem to buy into this division of worlds by circumscribing what they call *archaeological science*. The term has been popularized in the past 20 years and has become central to some archaeologists' self-conception. It denotes a kind of archaeology that integrates natural scientific methods so thoroughly that it arguably falls under the rubric of natural science. It is often used to signal the methodological orientation of journals, degree programs, departments, and institutions. In some cases—particularly in European contexts—the term represents such a deep methodological division that it has caused departmental splits, resulting in the creation of separate archaeology and anthropology departments.[9] So, one might distinguish between archaeological science and theoretical archaeology and argue that the former does not count as social science and therefore does not speak to its epistemological import.

But things are not so simple. As Killick points out, the idea that "archaeological theorists and archaeological scientists inhabit different universes is easily refuted" (Killick 2005, 186). Killick cites a number of archaeological theorists that have drawn on hard science and, conversely, a number of archaeological scientists who have contributed to archaeological theory (Killick 2005, 186). He also points out that the aims and methods of theorists and scientists are enmeshed, which is now reflected in archaeological education and training (Killick 2005, 187–8). Reitz and Wing likewise comment that the perspectives of anthropology, archaeology, biology, classics, ecology, geography, history, and the humanities are *integrated* in zooarchaeological studies (Reitz and Wing 2008, 5). So, once these hybridized fields emerge, it becomes impossible to disentangle the contributions of various disciplines, methods, and paradigms.

4.2. Technology and Data Collection

Archaeologists have long relied on sophisticated technologies and instruments to conduct their research. As far back as the 1950s, proton magnetometers allowed archaeologists to identify buried objects without the need to excavate, by measuring how such objects affect the earth's magnetic field. In fact,

9 I thank Elizabeth Sawchuk for these insights regarding archaeological science and its significance.

archaeologists Edward Hall and Martin Aitken designed and constructed their own magnetometer and used it in archaeological studies starting in 1958 (Pollard and Bray 2007, 248). Archaeologists also use synchrotrons—machines that produce intense and focused beams of radiation in the whole range of the electromagnetic spectrum—to analyze ceramic, stone, metal, wood, glass, ink, paper, bone, and bone mineral (Pollard and Bray 2007, 251). They also began to rely heavily on spectrometry during the radiocarbon revolution of the mid-20th century and now implement a range of tools for measuring carbon-14 decay, including spectrometers designed for Raman spectroscopy, laser-induced breakdown spectroscopy (LIBS), x-ray fluorescence (XRF), and reflectance spectrometry (Chimenti, 2020). In fact, "the worlds of spectroscopy and conservation sciences have become so deeply intertwined that the Society of Archaeological Sciences (SAS) officially became a member of the Federation of Analytical Chemistry and Spectroscopy Societies (FACSS) in 2019" (Chimenti, 2020). This is an example of the integration not just of research programs and methods, but also of professional networks and associations. Digital technologies are an additional and increasingly important family of technologies integral to archeological research. For instance, archaeologists rely on geographic information systems (GIS) to integrate and map location data, as well as cutting-edge digital recording techniques that enable photorealistic 3D modelling (Benavides López et al., 2016).

Moreover, a wide range of technologies are implicated in a process integral to archaeological research: remote imaging. Such technologies include sensors and scanners mounted on satellites, drones, and other airborne craft. These technologies have been "particularly transformational, allowing [archaeologists] to capture more sites and features, over larger areas, at greater resolution, and in formerly inaccessible landscapes" (VanValkenburgh and Dufton 2020b, 51). The sheer volume and variety of data collected through remote imaging brings me to the next significant shift in archaeological practice: its integration of so-called big data.

Big data is an amorphous term, which has various non-equivalent senses. It is often used to allude to the unprecedented quantity of information collected by digital technologies. In the primary sense of the term, datasets are considered *big* when they exceed the typical capacities of software and hardware to manage and store. However, there are other senses of the term. For instance, sometimes datasets are considered big when they are "richer than before and […] span several levels of analysis, from the individual to the collective" (González-Bailón 2013, 148). Big data is collected from a wide

range of sources, including social media communications, cursor behaviours, and clicks; search queries; online purchases; video views; location services on mobile devices; and innumerable other sorts of interactions on web services, games, and applications. The sheer volume of data collected is difficult to fathom. As of 2014 (an eternity ago in tech years), Facebook accumulated 4 petabytes of data per day (Wiener and Bronson, 2014). That is the equivalent of 6 million CD-ROM discs of information, over 3.4 years' worth of 24/7 full HD video recording, or 300 million MP3s (Fisher, 2021).

Importantly, we have an unprecedented amount of *social* data pertaining to "discrete behaviors, social expressions, personal connections, and social alignments" (Shah et al. 2015, 6-7). Social scientific research now uses complex datasets, electronic databases, and computational and algorithmic approaches such as machine learning (Shah et al. 2015, 7). Social and electronic media sources can be used to score the emotionality of news content, trace signals of public opinion, understand political alignments, predict online relationships, examine dynamics between conventional and social media, identify avenues of emotional contagion, identify environmental pollution patterns, and understand the spread of contagious disease (Shah et al. 2015, 8–9). There is much to say about the challenges facing big-data-driven science, including issues pertaining to data quality, privacy, representativeness, and encoded bias.[10] Nevertheless, the range of potential social scientific research applications is astounding.

To return to the example of archaeology, let me highlight some examples of how big data figures into archaeological research. As I mentioned, remotely sensed data such as imagery from satellites, drones, and LIDAR are quickly amassing, leading archaeologists to proclaim that "[b]ig data have arrived in archaeology" (VanValkenburgh and Dufton 2020b, 51). These and other forms of data—such as data from GPS devices—compose a broader class of geospatial data, i.e. data concerning the relative positions of things on the earth's surface. Geospatial datasets are growing at a rate that creates real challenges but also means that "the hyper-technical side of archaeology is more important than ever" (McCoy 2017, 75). The introduction of big data is quickly changing the shape of archaeological research and expanding its capacity for discovery.

Take, for example, the English Landscape and Identities (EngLaId) project, which was a five-year European Research Council funded research project that ran from 2011 to 2016 out of the Institute of Archaeology at

10 See Boyd and Crawford (2012), Cowls and Schroeder (2015), González-Bailón (2013), and Shah et al. (2015).

Oxford. The project "looked at the long-term history of the English landscape from 1500 bc to ad 1086, combining evidence on landscape features, such as track-ways, fields, and settlements, with the distribution of metalwork" (Cooper et al. 2021, v). The project aimed to synthesize all major available datasets from English archaeology to create a database with almost 1 million items drawn from a range of sources (Cooper et al. 2021, v). The project was fruitful, producing several major outcomes, including national-scale models of susceptibility to soil erosion, topographic factors influencing movement, patterns of clearance, and the structure of archaeological evidence across England (Cooper et al. 2021, 401).[11]

4.3. Quantitative Methods and Models

With rapidly increasing volumes of data, it is now essential that archaeologists be familiar with statistical modes of data analysis. Yet it is worth stressing that this is just the continuation of an already established trend toward formal and empirical methods in archaeological research.[12] The mathematization of archaeology began in the mid-1960s and involved the introduction of multidimensional scaling, factor analysis, principle component analysis, correspondence analysis and various forms of cluster analysis into archaeological research (Djindjian, 2009). Quantitative methods are now entrenched in archaeological methodology and training. As one archaeologist comments:

> Archaeologists of any persuasion routinely use statistical analysis and scientifically obtained environmental data […] Scientific methodologies and procedures and data are important to all of us; the necessity to be something of a jack-of-all-trades, having to be aware of isotope analysis *and* cultural theory, Bayseian modelling *and* social anthropology, is what makes the discipline particularly challenging. (Pluciennik 2006, 40)

The arrival of big data in archaeology has fostered new developments in *computational archaeology*, which implements the applied mathematical and statistical tools of data science, including machine learning, algorithms, and

11 For more discussion of the prospects and problems facing big data in archaeology, as well as detailed examples of its applications, see VanValkenburgh, Parker and Dufton (2020a).

12 I do not wish to take a stand on whether mathematics is a science or whether mathematical techniques are distinctively scientific. For my purposes, it is enough to say that mathematics belongs to the toolkit of natural scientists and is instrumental to many of their successes.

data mining (Hindman, 2015). Computational archaeology offers "a new way to couple the rich and varied database of the archaeological record with field observations of societies today, microscale social experiments, and the complex dynamics of large-scale socioecological systems" (Barton 2013, 172). Importantly, these formal tools imbue archaeological research with greater empirical tractability, by improving archaeologists' capacity to quantify uncertainty and make predictions (Hindman 2015, 48-9). In particular, the quickly growing body of archaeological data allows archaeologists to create, test, and improve computational models that can generate more reliable predictions (Barton 2013, 171). Increasingly refined methods of predictive modelling are used to predict probable locations of unknown archaeological sites and materials and to guide policy in cultural resources management (Verhagen and Whitley, 2011; Yaworsky et al., 2020).

As an example, GIS, remote sensing data, and archaeological field data concerning 233 known funeral sites in a sampling zone in the Awsard area of southern Morocco were used to construct a model predicting additional, unknown site locations (Nsanziyera et al., 2018). The model relied entirely on physical properties of the landscape. A second field campaign, in which 582 supplement sites were recorded, was then carried out to test the model. The result was that the model's prediction map accurately predicted the location of funeral monuments with a gain of 92.8% (Nsanziyera et al. 2018, 16). The study's authors conclude that "a well-built predictive model can provide reliable predictions of where archaeological sites should and should not be located in a given landscape" and take the study to have demonstrated "how effective predictive modelling could enrich archaeological knowledge about ancient cultures" (Nsanziyera et al. 2018, 16).

Additional examples of empirical methods used in archaeological research include *skeletal morphometrics*, i.e. the analysis of skeletal form (Pluciennik, 2006), as well as: "geophysical prospection, absolute dating programs, soil organic analysis, wider field survey, environmental reconstruction, material specialisms, and experimental archaeology and reconstruction" (Pollard and Bray 2007, 247). Again, it is important to note that these scientific methods have been so thoroughly integrated into the mainstream of archaeological practice and education that "archaeology and science cannot be treated as two mutually independent blocs" (Pollard and Bray 2007, 246).

To summarize, I have highlighted a number of trends in archaeology's methodology, including the integration of natural science, the use of sophisticated and cutting-edge technologies, the amalgamation of varied and voluminous data, the use of applied mathematical and statistical techniques to

more accurately model and predict, and the normalization of other empirical approaches. It is important for philosophers of science to recognize these methodological shifts and to consider these and other such accomplishments in their assessments of the epistemological credentials of social science.

4.4. How Happy is the Story?

My aim so far has been to highlight developments and successes at the forefront of archaeological research. However, it is not my intention to paint an overly idealized picture. Archaeologists have faced and continue to face challenges as they shift methodologically closer to the hard sciences. For one thing, the relevance of empirical evidence to archaeological research questions was not always immediately or universally embraced. For instance, "archaeologists were [initially] hostile to the outcomes and apparent implications of relevant genetic research: very few archaeologists embraced the genetic data […] with fervour" (Pluciennik 2006, 40). In such cases, methodological change is not as smooth, sweeping, or swift as one might like. Relatedly, as discussed above, the methodological shift has in some cases splintered the archaeological community in a way that silos perspectives and approaches.

In addition, although increasingly great volumes of data are available to archaeologists, there are serious concerns about data quality. For instance, the data in the EngLaId project were described as *characterful,* in the sense that they "have diverse histories, contents and structures and are riddled with gaps, inconsistencies and uncertainties" (Cooper and Green 2016, 294). Big data also frequently encodes bias and often fails to be representative (González-Bailón, 2013; González-Bailón et al., 2014). Moreover, some statistical techniques generate inaccurate models and predictions, due to the presence of variables ranging over unpredictable phenomena such as human behaviours. Statistical models can also be difficult to interpret, due to complex interactions among variables (Hindman 2015, 49). So, while the methodological shifts I have highlighted carry exciting potential to open up and advance avenues of archaeological research, they also introduce novel challenges. At the same time, those challenges are driving further research and methodological advancement, in that archaeologists and other social scientists are working to overcome them by creating detailed metadata, developing softwares that can link diverse datasets, and curating data to enhance faithfulness and unity (Cooper and Green 2016, 296–7); by improving sampling practices (González-Bailón, 2013); and by identifying more accurate and predictive modelling techniques (Hindman, 2015; Yaworsky et al., 2020).

Notwithstanding these challenges, the story I have told via this case study is largely a happy one. Extending the methods of the natural sciences to other forms of inquiry where applicable is a good thing, given their instrumentality in advancing objective inquiry. But here, one might wonder: just how representative is archaeology of the social sciences more broadly? Can similarly happy stories be told for the other social sciences, or am I guilty of cherrypicking?

Archaeology is representative of a broader trend. To take just a few illustrative examples, psychology has long been entangled with neuroscience in interdisciplinary endeavours, it uses sophisticated machinery such as artificial intelligence and robotics (Ardila, 2020), it is grappling with the rapid encroachment of big data (Adjerid and Kelley, 2018; Chen and Wojcik, 2016), and experimental psychologists routinely use empirical and statistical methods (Nesselroade and Cattell, 1988). Moreover, sociology exhibits interdisciplinary contact with natural science in the context of subfields such as medical sociology (Pilnick, 2013), it uses a plethora of digital technologies (Marres, 2017; Murthy, 2008), and it is likewise facing an increasing tide of big data (McFarland et al., 2016), the analysis of which requires computational methods (Mützel, 2015). Consider also economics. Mathematical modelling is ubiquitous in economics. It is applied to "virtually all areas of economic research" (Medio, 2009), which gives economic theory a degree of empirical tractability. *Econometrics,* in particular, integrates sophisticated statistical methods that enable hypothesis testing and prediction (Gujarati et al., 2017). Moreover, economists have been instrumental to the development of certain technologies, such as the software package STATA (Newton, 2005), which a wide range of researchers use to manage, manipulate, visualize, and report data. Finally, political science interacts with natural science on interdisciplinary projects such as the Governance of Livestock Disease (GoLD) project at Warwick, which explored decision-making frameworks in the management of livestock disease and included contributors from the life sciences and political science, among other disciplines (University of Warwick, n.d.). Political science also uses a range of digital technologies such as Amazon's Mechanical Turk (MTurk) (Berinsky et al., 2012). It integrates laboratory experiments to test theories that make predictions about, e.g., group dynamics and choices (Bottom et al., 2000), it contends with big data (Jungherr and Theocharis, 2017), and it routinely implements and innovates sophisticated statistical techniques (Bakker and Poole, 2013; Bonica, 2013) and produces predictive models (Cranmer and Desmarais, 2017; Montgomery et al., 2012). So, archaeology is by no means

an outlier among the social sciences when it comes to its growing proximity to hard science.

This suggests that a number of alternate case studies would have suited my purpose equally well, and it may be instructive to pursue some of them under separate cover. Moreover, in keeping with my earlier point that social science may have *sui generis* features in virtue of which it is scientifically rigorous, as well as my acknowledgement that the given case study does not necessarily have clear social metaphysical import, it would be valuable to pursue additional case studies exploring the distinctive scientific strengths of other social sciences and social scientific research programmes. I will leave this work to others and conclude by considering how the case study I have performed enables us to draw some more general conclusions.

5. PHILOSOPHICAL LESSONS

The shifting methods I have discussed compose a rich package. The point I want to emphasize is that, given its richness, it is hard to deny that the package is epistemologically significant on the whole. One might argue that certain elements of the package are less obviously significant than others. Still, even if such an argument were to succeed, it would not make a difference to the overall conclusion I want to draw, which is that surely some part of the long story I have told makes a positive difference to the epistemic prospects of archaeology—and, to the extent that archaeology is representative of the social sciences, to the prospects of the social sciences more broadly. As a corollary, it follows that philosophers should adjust their estimations of those credentials accordingly.

One might wonder precisely how and in what sense the methods I have discussed are epistemologically significant. Methods are *epistemologically significant* when adopting them plausibly makes a difference to the capacity of the relevant inquirers to produce epistemic goods or achieve epistemic aims, such as knowledge, understanding, explanation, discovery, true belief or justified belief. There is a great deal of room for further analysis and argumentation concerning precisely which of the methods discussed are epistemologically significant in my sense, in which ways, and to what extent. For instance, we might ask how sophisticated technologies improve social scientists' capacity for discovery, or how some particular statistical approach lends greater justification to social scientific claims, or how big data contributes to justification. These are big questions, beyond the scope of this paper. My purpose here is just to point out that it is plausible to think that *some* of the methodological trends I have highlighted contribute to *some* properly epistemic

aims—enough that we should rethink, or at least temper, narratives that paint social science in a deeply unflattering light.

We may now return to the framing issue of the paper—the question of the advisability of appealing to social science in the course of pursuing naturalistic social metaphysics. One might think that my overall conclusion is far too humble to change the skeptic's verdict. After all, I have not provided a full-fledged case for realism about social science. Perhaps the raw materials for such a case are here, but it would take a good deal more work to support a realist conclusion. However, I believe the considerations I have raised show that the case for anti-realism is exaggerated.

Moreover, my case study suggests that a wider range of criteria than has traditionally been recognized may bear on the question of realism. It highlighted an array of interactions and affinities that blur the lines between archaeology and natural science, and it is plausible to think that some of them bear on whether we should take archaeology and other social sciences to give us the approximate truth. After all, it is plausible that the use of scientific instruments, big data, empirical methods, and sophisticated statistical tools are implicated in some of the successes of natural science. The demonstrable fruitfulness of their application to social scientific research suggests that those same methods can lead to success in social science, too. None of those factors is individually sufficient to establish realism about social science, but taken on the whole, they are suggestive. If they are not sufficient to warrant full-on belief, then they should at least increase our credences in the outcomes of social science research.

At the same time, it is not clear that naturalization is only advisable or potentially fruitful on condition of realism. This point is both significant and under-appreciated. Proponents of naturalization often assume something like the following: "Naturalized metaphysics works hand-in-hand with scientific realism. In order for science to serve as a reliable guide to metaphysics, we have to have reason to believe our theories tell us what the world is really like" (Saunders 2020, 140). However, I suggest that naturalism and realism can come apart.[13] If realism is a precondition of naturalization, then we should only index a metaphysical inquiry to some scientific theory if we have good reason to believe that the scientific theory is true. However, that only follows if our epistemic aim in constructing metaphysical theories is to gain true belief or knowledge. Those are natural aims of objective inquiry, but there are other accomplishments that science and naturalized metaphysics might be thought

13 See Lauer (2022) for an example of what this might look like.

to achieve, aside from truth and knowledge. For instance, science might be thought of as our best current framework for describing the world, even if it is not literally true. We might think it provides the best available evidence about the world at the present time, even if we do not accept its approximate truth. Alternatively, we might value the role of science in enabling discoveries. If one recognizes the significance or value of these less lofty epistemic aims, one can think that naturalizing metaphysics is still a good idea even if one is not willing to grant approximate truth. That is, one can be an anti-realist about science while still thinking naturalized metaphysics is far better off epistemologically than non-naturalized metaphysics. There is plenty of space to argue that science—and, plausibly, metaphysics constrained by science—performs comparatively well on metrics that are independent of truth but that are nevertheless epistemic (see Bryant 2024 for further discussion).

The implications of these philosophical lessons for how social metaphysicians should approach their work can be summed up as follows:

1. They should not adopt generalized social science skepticism or allow such skepticism to dissuade them from viewing social science as an appropriate basis for naturalizing social metaphysics; if they are independently persuaded of the advisability of naturalizing metaphysics, generalized social science skepticism should not lead them to treat social metaphysics as an exception.
2. They need not believe in the approximate truth of social science (or some piece of social science) to legitimately seek to naturalize social metaphysics on the basis of it; research exploring non-realist forms of naturalized social metaphysics may be of potential interest.

These are negative implications, and of course there is a great deal of room to specify positively how a naturalistic social metaphysician should approach her work. New and interesting research is beginning address this question (Kincaid, 2024; Sarkia and Kaidesoja, 2023).

6. CONCLUSION

The framing issue of the paper was skeptical challenges to the naturalization of social metaphysics by appeal to social science. Some philosophers' reluctance to view social science as an adequate basis for social metaphysics is rooted in Kuhnian and realist traditions in the philosophy of science, which have regarded social science as second-rate science. Using a case that highlighted the many ways in which archaeology is approaching the practice of natural

science, I set out to show that inherited social science skepticism should be tempered. I claimed that those methodological developments should positively impact our judgments of the epistemological credentials of the social sciences, including their realist credentials. However, I also suggested that naturalists need not be committed realists. The paper has therefore achieved two main things: (1) it has removed an argumentative roadblock to the use of social science in the naturalization of social metaphysics, and (2) it has made a case for re-examining whatever social science skepticism has been inherited from prior philosophical traditions.

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