Canadian Journal of Philosophy (2022), 52: 3, 256–278
doi:10.1017/can.2022.33

ARTICLE

Humanizing Science and Philosophy of Science: George Sarton, Contextualist Philosophies of Science, and the Indigenous/Science Project

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Abstract

A century ago historian of science George Sarton argued that "science is our greatest treasure, but it needs to be humanized or it will do more harm than good" (1924). The systematic cultivation of an "historical spirit," a philosophical appreciation of the dynamic nature of scientific inquiry, and a recognition that science is irreducibly a "collective enterprise" was, on Sarton's account, crucial to the humanizing mission he advocated. These elements of Sarton's program are more relevant than ever as philosophers of science articulate research programs that take seriously the contextual factors, situated interests, and historical contingencies that shape the sciences we study. I trace the trajectory of a long-term philosophical engagement with archaeology that illustrates a succession of ways in which social, cultural, and political values configure inquiry, culminating in a program of collaborative research that raises the question of what role philosophers can usefully play when the challenges of humanizing scientific practice have centrally to do with navigating entrenched asymmetries of power.

Keywords: Humanizing science; contextualism; values and science; socially responsible science; archaeology; collaborative research practice; George Sarton

1. "Science is our greatest treasure."

The "science and values" turn in philosophy of science is often taken to be a new departure, and in many respects it is. But as History of Philosophy of Science (HOPOS) colleagues remind us, a century ago many founders of our field took for granted the deeply social, values-inflected nature of scientific inquiry, and argued that a crucial role for history and philosophy of science was to cultivate an appreciation of these dimensions of science among its practitioners. George Sarton, a pivotal figure the history of science, was one of these. In his famous 1922 lecture for the American Association for the Advancement of Science (AAAS), "The New Humanism" (published in 1924), Sarton articulated a vision for "humanizing" the sciences: "Science is our greatest treasure," he argued, "but it needs to be humanized or it will do more harm than good" (1924, 33).

First and foremost, on Sarton's account this humanizing project should bring to the sciences an "historical spirit," a recognition that empirical inquiry is a continuously unfolding process, its open-ended contingency often leading to insights that were not anticipated, much less sought, by its practitioners. Recognizing the dynamic nature of science, he argued, could ensure that our current best science never hardens into a "final doctrine": "fixed knowledge is dead knowledge" (1924, 27). It also requires a recognition that science is a collective enterprise, one that depends on the "combined efforts of all peoples" (11); a living, growing science will thrive only given an expanding

web of "social ties" (24). Indeed, Sarton considered it a "vital necessity" that scientific inquiry should be informed by "the sympathetic study and understanding of the thoughts and ways of other peoples" (26), not only to enrich the resources on which scientists draw but to foster in them a "keener realization of one's ignorance," an ongoing reckoning with the limits of their own methods and understanding (21). In short, the fierce commitment to rigorous inquiry that Sarton prized above all else must be "tempered by … humility and charity," a "broadness of outlook and boundless generosity" (21–22).[1]

In what follows, I first consider humanizing lessons that arise from taking philosophy into the field—the archaeological field. These reinforce insights that motivated a succession of contextualist philosophies of science; they illustrate how, in concrete and practical terms, empirical inquiry is configured by the values, interests, and assumptions of those who set the agenda, do the research, interpret and apply its results, and by the institutions and disciplinary cultures within which they operate.[2] I then broaden the frame to consider lessons drawn from the forms of community-based and community-led collaborative practice that archaeologists have developed in partnership with Indigenous communities in recent decades. Challenging though such collaborations often are, they are proving to be a crucial means of transforming research practice in ways that both reinforce and extend Sarton's program for "humanizing science," and that illustrate many of the key points made by philosophers of science who advocate not just a more thoroughly social contextualism, but one that is normatively engaged: one that aims to articulate norms of socially responsible science. I return, in the conclusion, to the questions framed by Sarton about the role that historians and philosophers of science can play in fostering these humanly, socially engaged modes of practice. I argue that, to do this, we must be prepared to humanize our own practices; attending to and, indeed,

[1]To be sure, there are aspects of Sarton's humanism that should be set aside, or require significant revision. For example, the internationalism he advocated provides a quite different rationale for collaborative partnerships than the motivations and commitments than inform the community-led archaeological research I describe here. I think Alan Richardson for helpful conversations about Sarton's legacy as an historian of science when I was preparing to give the 2020 Sarton Memorial Lecture.

[2]I use the term 'contextualist' here to refer to several post-positivist research programs that took shape in a response to critiques of "Received View" philosophy of science and the associated ideal of value-free science. I take the point of departure for these to be the epistemic contextualism of Hanson (1958), and Kuhn (1962), anticipated by Fleck ([1935] 1979), in which historically specific conceptual and methodological factors were understood to configure scientific inquiry. As Kourany describes these approaches, they represent an initial move away from philosophical ways of understanding science that proceed "as if science existed in a social/political/economic vacuum" (2010, vii); they are characterized by a recognition that "the rationality of science" cannot be conceptualized strictly in terms of the "logical aspects of science" attributed to a value-free context of justification, as opposed to the value-informed contexts in which the agenda of scientific inquiry is set or its results applied in technical and social (extra-scientific) contexts (2010, chap. 1, 107).

This early genre of contextualism generates what Kourany calls "old worries about science": the anxiety that, if there is no "theory-neutral fact-stating language, hence no theory neutral-facts" (2020, 3), it seems inescapable that that the empirical integrity of science is undermined by a pervasive threat of theory-driven "fact construction." She argues that these "old worries" are misplaced; given the ongoing success of a wide range of scientific research programs "scientific rationality appeared to be robustly healthy at precisely the moment that, to philosophers, it seemed to be seriously ailing" (4). I make a similar argument below, and offer an account of evidential reasoning in archaeology which suggests why this epistemic pessimism missed its mark.

As the sharply drawn divide between philosophy of science and science studies has been eroded, philosophers of science have explored more robustly social analyses of science. The "values in science" research program that has flourished in recent decades includes an "aims approach," described below, that attends to the implications of recognizing that the selection of research problems, seen as legitimately value-informed on traditional views of science, configures all aspects of scientific inquiry. Kourany describes this as giving rise to "new worries" about science: that the values embedded in the aims of science inevitably result in an "ongoing shaping of the facts that science presents" (9). This is giving rise to modes of contextualist analysis that prioritize critical scrutiny of the normative commitments of scientific inquiry (e.g., Hicks 2014; Kourany 2010), and that are, themselves, socially and politically engaged (see note 40).

There is much work to be done to realize these reframed philosophical ambitions. Sample (2022, 3) offers a trenchant appraisal of the ways in which the philosophical idealizations of "science" that informed earlier, epistemic genres of contextualism—the "Kuhnian assumptions that science is a social but self-contained epistemic practice"—continue to configure the work of philosophers of science who aim to understand science in more richly social-contextualist terms.

https://doi.org/10.1017/can.2022.33 Published online by Cambridge University Press

actively engaging in the collaborative research programs taking shape in the sciences we study has reciprocal benefits for our own practice.

2. Humanizing vernacular positivism

To illustrate Sarton's humanism in action, consider an example of philosophical debate that I encountered in the context of an archaeological field program when I worked at Fort Walsh, a Northwest Mounted Police (NWMP) fort in the heart of the Cypress Hills, southwest Saskatchewan. This was one of several National Historic Sites (NHS) where Parks Canada was running an ambitious field research program in the 1970s an 1980s.[3] As a philosophy student I was struck by how much attention the archaeologists I worked with gave to philosophical issues. Sarton's "attitude of the philosophical scientist" (1924, 21) was clearly evident in ongoing debates about whether the NHS-mandated aims of the project were well served by the conventions of archaeological practice that informed our work as we surveyed and excavated, mapped, and recorded the surviving record of the NWMP presence on the site. North American anthropological archaeology was then in the throes of a "revolution," as described by the advocates of "processual" New Archaeology who had trained our field director.[4] They rejected the "narrow empiricism" of "traditional" archaeology which, on their view, perpetuated a barely reformed antiquarian preoccupation with recovering and systematizing archaeological data as an end in itself. Ironically, however, the philosophical models of science invoked by the New Archaeologists were drawn from what came to be known as "Received View" philosophy of science, a form of logical positivism then widely reputed to be meeting its demise (Suppe 1977). What they advocated was a vernacular logical positivism, not unlike that which has been influential in a good many social sciences (Wylie 2002, 78–80). It was anything but a bulwark against the kinds of epistemic ideals—empirical foundationalism and inferential certainty—that underwrite the quest for fixed and final science Sarton warned against.

The New Archaeologists' appeals to covering-law models of explanation and a hypothetico-deductive account of confirmation informed their programmatic arguments for a properly scientific approach to archaeology. By contrast to the limited ambitions of traditional archaeology, they

[3]For an account of the Fort Walsh project and my role in it, see the preface to *Thinking from Things* (Wylie 2002) and my APA Dewey lecture (Wylie 2017a), and for a history of Fort Walsh, see the Fort Walsh National Historic Sites website (Parks Canada 2018). To situate this discussion, here is an overview of that history and the NHS archaeological research program.

Fort Walsh was established in 1875 in response to increasingly violent confrontations between Indigenous peoples and what a Parks Canada historian described as an "invasion of the Canadian prairies by a horde of American whiskey traders who callously peddled their rotgut product to the local Indians" (Karklins 1987,1–2). Evidently the whiskey trade at the time did quite literally peddle rotgut; it is described as "100% grain alcohol cut down with water before other ingredients, such as tobacco, red ink, Jamaica ginger, and sometimes strychnine, were added" (Parks Canada 2018).

The Cypress Hills, just north of the US border on the Whoop-Up Trail (Sharp 1973; Kennedy 1997), was the locus of a thriving trade in buffalo hides that were transported overland to Fort Benton, Montana, and then by riverboat down to the processing factories and market centered in St. Louis. A brutal massacre of a band of Nakoda (Assiniboine) by traders and wolf hunters in the Cypress Hills in 1773 prompted the fledgling Dominion of Canada government to dispatch a contingent of NWMP to Fort Walsh. They were to assert Canadian sovereignty, patrol the international border, and enforce the terms of the Northwest Territories Act of 1875 which declared any trade in or production of "intoxicants" illegal.

Within a few years, however, the buffalo herds that had attracted the traders were hunted almost to extinction, destroying the subsistence base of the Indigenous peoples in the region and, with this, the lucrative trade in buffalo hides collapsed. The Canadian government turned its attention to the agenda of resolving the "Indian situation" so that it could open its western frontier to settlement (Karklins 1987, 1). Fort Walsh was briefly one locus of treaty negotiations on the prairies. It was decommissioned in 1883 when the Canadian Pacific railroad reached the region, and the Cypress Hills have since been prime ranching territory. The Royal Canadian Mounted Police purchased the property in 1942 and built a rough replica of the nineteenth-century fort based on historic photographs and an amalgam of assumptions about earlier forts in eastern Canadian. They ran a horse breeding and training station on the site until the late 1960s when Fort Walsh was transferred to Parks Canada and designated a National Historic Site.

[4]See below for an account of the central philosophical tenets of the New Archaeology, and for additional detail, see Wylie (2002, pt. 2), and Chapman and Wylie (2016, chap. 1).

https://doi.org/10.1017/can.2022.33 Published online by Cambridge University Press

insisted that the goal of inquiry must be to develop explanations of the particulars of cultural history and lifeways in terms of putative laws of long-term, large-scale cultural processes understood in "eco-materialist" terms. To this end, they called on their colleagues to invert the traditional practice of building "just so" stories to account for what they found in the archaeological record. Rather than treating these as the terminus of archaeological inquiry, archaeological research should be rigorously problem oriented; surviving material traces of the cultural past were to be valued, first and foremost, as a resource for testing explanatory hypotheses about human–environment interactions operating at the level of cultural systems. Processual New Archaeologists insisted that this reorientation—simultaneously ontological, epistemic, and methodological—constituted nothing less than a Kuhnian revolution.[5]

In the context of grappling with the realities of fieldwork, the jointly epistemic and methodological debates I was party to at Fort Walsh in the mid-1970s called into question not only the norms of "traditional" archaeology as exemplified by the NHS research program, but also virtually every key tenet of the logical positivism endorsed by the New Archaeologists; they resonated with the genre of contextualist accounts of the theory-laden nature of evidence that were getting traction in post-positivist philosophy of science at the time.[6] We grappled with the implications for hypothesis-testing methodologies of recognizing just how much interpretive judgment goes into identifying and recording "data" that count as archaeological and putting them to work as evidence, even on a site as recent as Fort Walsh. For example, the NWMP were stationed at Fort Walsh for the express purpose of controlling the whiskey trade and yet one of the most prominent types of artifact we found were alcohol bottles: champagne, French wine, and cognac bottles in the commandant's latrine; American beer and whiskey bottles in the officers' latrines and under the floorboards of their barracks; and large quantities of high alcohol–content medicine bottles in a wide range of contexts including the footing trenches of the enlisted men's quarters (Murray and Sciscenti 1977, 163, 175–78; Lunn 1979; Murray 1977). In contravention of their mission, the archaeological record delivered uncompromising evidence that large quantities of alcohol were present and presumably consumed by the NWMP stationed at Fort Walsh. Even so, it was not altogether obvious what to make of these material traces as evidence. Did they represent expropriated and illegally consumed contraband, or ongoing (also illegal) cross-border trade in intoxicants that now catered to the rank-differentiated tastes of the NWMP? The second commissioner to oversee Fort Walsh, A. G. Irvine, issued a general order in 1880 that "the most rigorous steps are to be taken for the stoppage in liquor traffic" including "intoxicating medicines" but, if anything, the archaeological evidence suggests that the volume of trade in these medicines increased over time (Sciscenti et al. 1976, 160–67).

Other lines of evidence indicate that although the NWMP were charged with implementing Canada's Indian policy, which meant enforcing law and order and initiating treaty negotiations, they were heavily reliant on "Indian products" for survival. Indigenous butchering techniques were evident in the faunal assemblages we recovered and the beads we found embedded in the compacted subfloor deposits of the barracks suggest a widespread practice of amending NWMP uniforms with a range of climate-appropriate Indigenous clothing (Sciscenti et al. 1976, 236–41). Perhaps the boundaries between the NWMP and Métis were a good deal more porous than acknowledged in official reports and histories. In a similar vein, although Fort Walsh is described as the "largest and most heavily armed fort that the North West Mounted Police garrisoned during their early years in

[5]This analysis of the legacy of logical positivism/empiricism in anthropological archaeology is developed in part 2 of *Thinking from Things,* in chapters on "The Conceptual Core of the New Archaeology" and "Emergent Tensions in the New Archaeology" (Wylie 2002, 57–95). The empiricist premises presupposed by logical positivism were not typically recognized by advocates of the New Archaeology who rejected the "narrow empiricism" of traditional archaeology (Wylie 2002, 5–6, 20).

[6]I have in mind here the epistemic contextualism Kourany describes in terms of "old worries" about science (2020) and that Sample associates with a broadly Kuhnian "imaginary of science" (2022); see note 2 above.

https://doi.org/10.1017/can.2022.33 Published online by Cambridge University Press

the West" (Parks Canada 2018),[7] it was essentially indefensible. It was located in a valley, visible from high ground on all sides, and surrounded by a gappy, unstable palisade that was constructed only after the first major buildings were erected (Scicsenti et al. 1976, 25). Excavation documented at least one meter-wide gap in the palisade with no evidence of a gate or footing trench (40), and the bastions seem not have been constructed with functional firing platforms; archaeological deposits inside the earliest of these suggest that it was used for grain storage (44).

In short, the material record of Fort Walsh ran counter to then-conventional accounts of NWMP life on the frontier, raising a number of questions about how it should be "read" as evidence.[8] The first insight that arose from taking philosophy into the field was that archaeological evidence is thoroughly a construct, but it is by no means a construct that obligingly conforms to expectation. This posed a challenge not only to the vernacular positivism of the New Archaeology but also to the constructivism of their "post-processual" critics who, a decade later, were invoking what Norwood R. Hanson described as the theory-laden nature of observation (1958) to support the conclusion that hypothesis-testing in archaeology is untenable. At their most uncompromising, they insisted that archaeologists inevitably "create facts" which reflect their expectations (Hodder 1983, 6), setting up such an intractable circularity that archaeological evidence must inevitably confirm their theories about the past; there is "literally *nothing independent of theory* or propositions to test against" (Shanks and Tilley 1987, III; see discussion in Wylie 2002, 172, 206). Neither of these views, articulated in abstract terms, do justice to the ways in which, even though archaeological evidence is undeniably an inferential construct, it can subvert expectations; sometimes it decisively challenges seemingly well-established claims about the past and brings into view cultural histories and forms of life that had never been considered.[9]

When archaeological data get purchase as a defeasible but nonetheless consequential source of empirical constraint on claims about the past, I have argued that it is precisely because of its dependence on a wide range of background claims and assumptions that "warrant" inferences about its evidential significance; crucially, these include empirical and technical as well as theoretical warrants (Wylie 2011, 2020; Chapman and Wylie 2016, 33–39). Archaeological data never confront hypotheses as a wholly autonomous empirical "tribunal" of their truth, and rarely do they establish evidential claims with certainty, but by no means are they all or only arbitrary interpretive conventions. There are at least three aspects of evidential reasoning that account for the capacity of highly constructed archaeological data-under-interpretation to counter the threat of "fact-shaping" (Kourany 2020; see note 2). For one thing, many of the warrants that mediate inferences about the evidential significance of archaeological data are themselves subject to empirical constraint, which means that the security of evidential claims can be systematically adjudicated; in the case of dating techniques, for example, this involves an ongoing process of assessment and calibration (Wylie 2020; Bokulich 2020). Moreover, the theoretical commitments that do play a role in evidential reasoning (alongside other forms of background knowledge), are not necessarily, or even typically,

[7]This is an especially striking claim inasmuch as the Dominion government decided to dispatch a police rather than a military force to the North-West Territories. Sharp makes the case that, given the state of Anglo–American relations at the time, Prime Minister John A. MacDonald and his cabinet were concerned that their counterparts in Washington would perceive the presence of "Mounted Rifles" in the region as an act of British imperialism (1973, 80–81), so minimized the military nature of the NWMP.

[8]Reporting on the Fort Walsh archaeology program in 1974, Halstead observes that the archaeologists familiar with the dig "can read the site like a book" (1974).

[9]These are the contextualist arguments Kourany cites as motivating the "old worries about science." In effect, post-processual critics of the New Archaeology took to their logical conclusion the implications of this genre of contextualism: that "the empirical basis of scientific knowledge is ultimately constituted by decisions to accept unjustified statements of fact" (2020, 3). The analysis outlined below of how archaeologists reason with evidence illustrates Kourany's point that empirical research was not irrevocably compromised by the kind of theoretical "fact-shaping" that worried these epistemic contextualists. It is an account of how, in practice, the "decisions to accept" statements of fact and claims about the evidential significance of fact are themselves empirically constrained.

https://doi.org/10.1017/can.2022.33 Published online by Cambridge University Press

the same as the theoretical assumptions that inform the reconstructive or explanatory hypotheses about past events, conditions, and processes that archaeologists use their evidence to support or to test. Combined with empirically grounded appraisals of the degree of security provided by mediating warrants, it is epistemic independence in this first sense—between the "theory" that ladens archaeological data-as-evidence, and theories that are the direct or indirect object of archaeological investigation—that archaeologists exploit when they make effective use of archaeological data as a source of empirical insight and constraint. In addition, archaeologists rarely depend on a single line of evidence; they typically enlist diverse ranges of background knowledge to constitute different types of data as evidence when building or testing archaeological hypotheses.[10] Epistemic independence in this second sense—between lines of evidence, each backed by its own set of warrants—puts archaeologists in a position to exploit strategies of triangulation and robustness reasoning (Wylie 2011, 381–89; 2020; Wimsatt [1981] 2012); diverse lines of evidence can be mutually constraining, exposing error as much as reinforcing one another.[11]

What I encountered in practice at Fort Walsh was the paradox that as enigmatic as archaeological data are, they also manifest a stubborn concreteness that, to paraphrase Lorraine Daston (2008, 11, 13), sometimes reasonably inspires confidence that they bear trustworthy witness to pasts (or aspects of the past) that may not be otherwise documented.[12] In archaeology, as elsewhere, evidential claims are always defeasible, but the "tangle" of interdependent, mutually constraining evidence of different kinds makes it possible to assess degrees of credibility that lie between the deductive certainty prized by New Archaeologists and the radical contingency on which their critics insisted. Archaeology at its best is an ongoing, iterative process of eliciting evidential friction and constraint.[13] Recognizing this, I would argue, is a matter of humanizing the vernacular positivism that was embraced by processual New Archaeologists.[14]

3. Humanizing philosophy of science

Other challenges to this vernacular positivism that were less discussed in archaeological contexts in the 1970s bring into sharp focus more profoundly humanizing lessons for philosophy of science that advocates of the "values in science" program have since explored. In the final year I worked at Fort Walsh, we successfully lobbied Parks Canada to support an archaeological survey of the park property which I directed (Wylie 1978). Up to that point, we had strict instructions to confine our attention to the fort itself: our mandate was to "uncover the precise configuration of the original Fort buildings" and recover "as many artifacts as possible" so that the Fort could be restored "to its exact original specifications and materials"—not a "vague copy of an Ontario fort from a different period" (Halstead 1974). Expanding the scope of our fieldwork program to the park property as a

[10]Currie's account of the dependency relationships among variables that comprise an historical subject, and between these and its surviving traces, captures nicely what is involved in the adjudication of security within lines of evidence and strategies for exploiting the independence between them (2018, 76–80).

[11]It is worth noting that the hypotheses archaeologists build and test rarely take the form of, or depend upon, the kinds of Hempelian covering laws invoked by processual New Archaeologists. They are more typically models of particular past cultural activities, lifeways, and dynamics the components of which are constrained at multiple points by background knowledge of diverse kinds (Wylie 2002, 75; 2011, 380; 2017b).

[12]In *Things That Talk,* Daston notes that the "brute intransigence of matter" has long mobilized conflicting intuitions about the trustworthiness of "things" as evidence. As she describes it, although they are also notoriously "mute" and, as evidence, vulnerable to interpretive projection, they can confound "the distorting filter of human interpretation" (2008, 11, 13; Wylie and Chapman 2015).

[13]This argument is developed in *Evidential Reasoning* with reference to Norton's discussion of "highly connected, massively tangled" structures of inductive of inference (Norton 2014, 673; Chapman and Wylie 2016, 39–40), and Chang's account of epistemic iteration (Chang 2004, 44–46; Chapman and Wylie 2016, 45).

[14]As suggested earlier (note #2), this analysis illustrates why the "old worries about science" were, as Kourany argues, misdirected (2020, 4).

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whole fundamentally reframed our understanding of life in the Cypress Hills during this volatile period (Wylie 2017a, 123).[15] We documented dense concentrations of Indigenous encampments—First Nations tipi rings, lithic scatters, and cairns on the bluffs and benches overlooking the Fort—as well as clusters of pit features along Battle Creek and historic trails, likely associated with Métis trading posts and households, that had gone unrecognized, undocumented, and unprotected. A visitor reception center had been built in the middle of a major encampment site, and utility roads transected lithic scatters and cellar pits. Parks Canada has since made First Nations and Métis history central to the management plan for Fort Walsh (Parks Canada 2013) and, on the official website for Fort Walsh, the NWMP are now described as "the advance guard of wholesale invasion and settlement" of the Canadian prairies (Parks Canada 2018).[16] But apart from a recognition that the catalyst for establishing a NWMP fort in the region was the infamous Cypress Hills massacre of 1873 (see note 3), this Indigenous history was not taken into account in the archaeological investigation of the site when it was being developed as a national historic park.

This lack of attention to First Nations history and heritage was by no means unique or inadvertent; it was explicit in the priorities set by Parks Canada for its archaeological research program at Fort Walsh in the 1970s. The relevant philosophical insight here, central to the "aims approach" to values in science proposed by Kristen Intemann (2015), is that the values and interests that set the research agenda configure all aspects of research practice; their influence cannot be circumscribed by stage of inquiry or role.[17] Reviewing these aspects of a "contemporary program for a 'contextualized' philosophy of science" (Kourany 2010, vii), Ingo Brigandt (2015) provides a systematic assessment of reasons to doubt not only that social values can be excluded from contexts of inquiry and theory evaluation as required by an ideal of "value-free" science, but also that their influence can be limited in various ways—to the choice of background assumptions in what he describes as "inference from evidence" analyses, or to indirect as opposed to direct influence on the choices scientists in the course of a research program, as proposed by Heather Douglas (2000).[18] I concur with Brigandt's conclusions; a much broader role for "values" in science must be recognized

[15]In one early season at Fort Walsh, we surveyed and tested a civilian townsite that had grown up next to the fort. This was a short-lived archaeological foray outside the police compound that, as Halstead reported the following year, was of particular interest "because of the town's mixed population which [included] American, blacks, Canadians and Indians," but was curtailed because Parks Service funding was not "extended to cover the townsite" in subsequent field seasons (1974). The limited work we were able to do on the townsite, and later projects undertaken by a salvage crew when erosion threatened the site (Klimko et al. 1993) and for a master's thesis (Wutzke 2009), documented substantial business establishments and domestic households, as well as Indigenous encampments. Like the survey I directed, archaeological evidence from the townsite challenges assumptions about life on this short-lived Canadian frontier, especially with respect to the diversity of the population in the region and the relations between incomers and Indigenous peoples (Wylie 2017a, 122–23).

[16]Crucial to this reorientation was the leadership of Tom Lee, director of Parks Canada from 1993 to 2002 (Boychuk 2021).

[17]In this spirit, Brown (2013) makes the case that arguments from underdetermination and inductive risk fail to capture the multiple roles that values play in science, by no means all of them epistemically compromising; Elliott and McKaughan (2014) outline reasons why we should acknowledge that nonepistemic aims and values sometimes take priority over epistemic values; Hicks (2014) sets out a research program for distinguishing legitimate from illegitimate roles that values can play in science; and Elliott provides a case-based appraisal of the implications of these lines of argument (2017). The central principles of an "aims" approach were articulated by Anderson in her early articles on feminist epistemology (e.g., 1995), and they figure prominently in feminist standpoint theorists dating to the mid-1980s (Wylie 2012).

[18]Douglas's analysis extends arguments dating to 1950s for recognizing that inductive risk is an unavoidable feature of scientific inquiry; she shows that it cannot be limited to judgements about whether or not to accept a hypothesis given research findings, but must be understood to configure the choices scientists make throughout the research process with respect to methodology, the interpretation of data as evidence, and the assessment of evidential significance (2000, 2009).

In a significant extension of inductive risk analyses, Havstad (2021) makes the case that decisions about when and how to report the results of scientific inquiry must take into account their potential social impact, especially in the case of "sensational science." She focuses on aDNA studies and argues that, despite pressures to publish quickly and cater to public interest, if anything the methodological bar should be raised given the risks of reinforcing pernicious social stereotypes.

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that includes pragmatic and value-driven aims which, on his account, configure domain-specific "conditions of adequacy" that inform theory evaluation (Brigandt 2015, 343). The "new worries about science" discussed by Janet Kourany (2020, 7–9; see note 2) have to do with exactly this. "Fact-shaping," as she refers to it, arises from the value-informed choice of aims that determine which facts will be considered relevant and will be gathered, a process that can, she argues, "preclude the discovery of other facts" (2020, 8). Crucially, this has path-dependent implications for the capacity of future research to generate counterevidence that could call into question assumptions about the subject domain which inform the orienting aims of a research program. In the case of the archaeological work at Fort Walsh, Kourany's point about fact selection applies directly. In the first instance, the questions of interest to the NHS were limited to the NWMP at Fort Walsh, which meant that the archaeological record we had been creating as we worked within the confines of the fort compound systematically marginalized evidence of the presence of Indigenous peoples that the NWMP had been charged with policing and "settling."[19] The heritage we were investigating at Fort Walsh was that of the Canadian settler state, and the NHS research program was itself an extension of the settler state policies and practices we were documenting archaeologically. It was only when the aims of inquiry were reframed and the scope of the NHS research program expanded beyond the fort that "facts" situating the NWMP in the context of a much more complex history could be recognized—a history of Indigenous survivance in which, rather than reproducing eliminationist narratives, First Nations and Metis peoples are understood to have been a dominant force in the region and to have played an active role negotiating their rights and interests with a diverse cast of incomers.

At a broader level, Brigandt's point about conditions of adequacy also applies to the archaeological program at Fort Walsh, albeit in quite general terms. The orienting conventions of responsible archaeological practice at the time were complicit in perpetuating the legacy of displacement, appropriation, and denial originally enacted at Fort Walsh. The vernacular positivism that informed the Fort Walsh fieldwork, as much as the narrow empiricism of traditional archaeology, foreclosed active consideration of the political interests and social values embodied in the NHS research agenda; both were predicated on a conviction that the goals of archaeological science transcend any "parochial" situated interests and that sufficiently rigorous pursuit of these goals could be counted on to secure empirical results that are "value-free."[20] The second lesson I draw from taking philosophy of science into the field is that the epistemic contextualism catalysed by early critiques of Received View philosophy of science must itself be humanized in the senses now being explored by aims theorists; it must be reconceptualized in robustly social and normative terms. With respect to Sarton's humanizing mission, the point is that if philosophers of science are to play a role in counteracting the stultifying tendencies that concerned him—the risk that current best practice and scientific knowledge will harden into "fixed and final doctrine"—they must be prepared to scrutinize the

[19]As noted, when evidence of Indigenous presence was recovered within the frame of the fort-centered research agenda, it was treated as an anomaly. The point Kourany makes about the path dependence of research and the ways in which an originating choice of aims can foreclose future lines of inquiry is developed in especially compelling terms by Hacking in an essay on weapons research ([1983] 1999).

[20]In this case, the "domain-specific conditions of adequacy" are not theory specific; they are overarching epistemic-methodological norms that are assumed to be relevant to the assessment of any archaeological hypothesis or theory although, as post-processual critics point out, they weigh heavily in favor of the kinds of eco-system theories and models favored by New Archaeologists. The problem-oriented, New Archaeology approach that generated the internal debates I have described called into question the methodological priorities of this narrow empiricism, requiring that we excavate not just to recover archaeological material but with explicit interpretive and explanatory questions in mind. However, the critical lens it brought to bear did not include scrutiny of the normative commitments that informed the framing of these questions.

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purpose-specific goals and associated norms of practice that determine what counts as properly scientific practice in disciplinary research programs.[21]

4. Humanizing archaeology

By the turn of the 1990s, a series of tectonic shifts were taking place within archaeology and in its contexts of practice that brought these more robustly social and normative contextualist insights to the fore. Internal critiques, as well as challenges from a growing number of descendant communities intent on regaining control of their cultural heritage, were fundamentally changing the conditions under which archaeologists operate, provoking for many a reckoning with the role that archaeology had played in transacting and legitimating oppressive political agendas, including the eliminationist policies and practices of settler states. Indigenous and Aboriginal activists were winning significant legal battles, especially with respect to the repatriation of human remains and the protection of sacred and ancestral sites. In some contexts, this took the form of federal legislation, for example, the 1984 Aboriginal and Torres Strait Islander Heritage Protection Act in Australia and the 1990 Native American Grave Protection and Repatriation Act in the US. In Canada, the protection of heritage and burial sites that are not on federally owned land is a provincial and municipal responsibility, and provisions for their protection vary widely. Whether enacted on a broad or local scale, the enforcement of heritage legislation is notoriously uneven and, even when implemented, it typically has little effect on the questions archaeologists address or their research methodology.

Faced with the threat of externally imposed constraints on their practice, some archaeologists doubled down in their defense of the value-free ideal associated with the "narrow empiricism" of traditional archaeology and the self-avowed positivism of the New Archaeology.[22] They reject outright any demand that they be held accountable to the interests of nonarchaeologists, especially when these embody culturally distinctive ways of understanding and valuing cultural heritage. Some are explicit on the point that there is nothing of archaeological relevance to be learned from the "thoughts and ways of other peoples," as Sarton might put it (1924, 26),[23] and that nonscientific interests should not constrain the pursuit of scientific questions; a properly scientific understanding of the human cultural past is in the interests of, if not of interest to, all people, society as a whole, and should not be held hostage to the demands of special interest groups. Most fundamentally, the concern here is that any capitulation to the interests of descendant communities—any move to humanize archaeology in this sense—risks compromising the integrity of archaeological science. Unless a hard line is taken against the incursions of outsiders and their potentially biasing influence, there is no stopping the slide into corrosive relativism. Framing their objections in abstract terms, these internal critics articulate a defence of the value-free ideal as essential to scientific practice that echoes Paul Boghossian's philosophical arguments against forms of liberal pluralism that

[21]Kourany (2010) and Elliott (2017), among others, make the case that if you accept the central arguments of a robustly social contextualism, you must be prepared to address issues of accountability for the aims that configure inquiry in a jointly ethical/political and epistemic sense. Scientific inquiry is not only accountable for ensuring high standards of methodological rigor and empirical integrity in the pursuit of these aims; it must be responsive to the needs of society (Kourany 2010, 72), and to values that are "*representative* of major social and ethical priorities" (Elliott 2017, 14). By extension, Kourany argues, philosophers of science should be prepared to play an active role identifying and rectifying biased science agendas when, for example, the aims that set the agenda preclude recognizing or gathering counterevidence (2020, 12–16). See also Elliott's recommendations in "How Can We Engage These Values" (2017, chap. 7).

[22]This appraisal of reactions against the requirements of legislation like NAGPRA and the turn to collaborative practice within archaeology is developed in more detail in "A Plurality of Pluralisms" (Wylie 2015, 190–92).

[23]For an example of this type of response see McGhee (2008) and the responses published several years later by Croes (2010), Silliman (2010), Wilcox (2010), and Colwell-Chanthaphonh et al. (2010). It also figures in challenges to the credibility of oral traditions as a source of evidence relevant to archaeological understanding of Indigenous histories and cultural practices. See note 37 below.

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presuppose a "doctrine of equal validity" (2006, 2). On Boghossian's account, the epistemic norms typical of contemporary Western science, norms that exemplify "our own classical picture of knowledge" (19), uniquely approximate "absolute, practice-independent facts" that determine what should count, for all, as true beliefs and norms for their justification (110).[24]

At the same time, a growing number of archaeologists have responded to Indigenous demands for control over their cultural heritage with a commitment to reorient archaeological research so that it benefits nonarchaeological stakeholders, especially Indigenous communities when it is Indigenous history and heritage they study.[25] They seek out community-based and community-led collaborations, working in partnerships that reframe their research agendas, directing their efforts to questions that are relevant to and informed by the knowledge and expertise of Indigenous communities. A small but growing number of Indigenous archaeologists, as well as non-Indigenous archaeologists who work for Indigenous cultural and historic preservation offices, have been pivotal in building these working relationships. By contrast to critics who feared that any such engagement would be epistemically compromising, those engaged in such efforts point to a range of ways in which a commitment to values of social justice and accountability has significantly raised the bar epistemically.[26]

4.a Nineteenth-century legacies: Archaeology at c ə̓sna?əm

These shifts in the aims that orient archaeological research go hand-in-hand with critical appraisals of archaeology's colonial entanglements that often take the form of historical genealogies of specific research programs. These are, I suggest, one means of fostering a measure of the humility advocated by Sarton. They make explicit the purpose-specific contingency of taken-for-granted assumptions about the nature of the subject domain that configure the aims of inquiry, and throw into sharp relief the limitations of the methodological conventions and epistemic norms of justification—the domain-specific conditions of adequacy—associated with them. To illustrate what this involves, consider a case from the Indigenous territory where I now live and work:[27] a history of the Musqueam Band's engagement with the generations of archaeologists who have excavated the "Great Marpole Midden." In *These Mysterious People* (2006, 2016), Susan Roy details the process by which this famously rich and expansive Musqueam settlement at the mouth of the Fraser River—c̓əsna?əm—became, for archaeologists, a regional type-site in terms of which they defined the characteristics and developmental sequence of precontact Coast Salish

[24]In *Fear of Knowledge*, Boghossian introduces his arguments against misguided postmodern relativism with the example of two archaeologists who work in partnership with Indigenous communities and take seriously Indigenous values, interests, and systems of knowledge (2006, 1–3). In "A Plurality of Pluralisms" (Wylie 2015), I argue that he misrepresents the statements and the work of the archaeologists he refers to, selectively quoting a *New Yorker* article, and that his philosophical arguments for concluding that the "contingent social circumstances" of knowledge production have no bearing on norms of justification (2006, 19, 21) are untenable for all the reasons that have impelled philosophers of science to develop the array of post-positivist research programs discussed here.

[25]Inadequate though it is with respect to acknowledging Indigenous rights and interests, the "Principles of Archaeological Ethics" endorsed by the Society for American Archaeology (SAA) includes the following principle (#3): "Responsible archaeological research, including all levels of professional activity, requires an acknowledgment of public accountability and a commitment to make every reasonable effort, in good faith, to consult actively with affected group(s), with the goal of establishing a working relationship that can be beneficial to all parties involved" (SAA 1996).

[26]See "A Plurality of Pluralisms" (Wylie 2015) for an account of the epistemic advantages associated with collaborative practice in archaeology.

[27]The University of British Columbia is located on the traditional, ancestral, and unceded territory of the Musqueam people. "Traditional" recognizes that these lands have long been occupied by the Musqueam people; "ancestral" acknowledges the Indigenous systems of law under which they been cared for and handed down from generation to generation; and "unceded" means that they were never turned over to the Crown by treaty or other agreement (University of British Columbia Indigenous Portal n.d.).

https://doi.org/10.1017/can.2022.33 Published online by Cambridge University Press

cultures.[28] Archaeologists date its earliest occupational levels to at least four thousand years ago (from 2400 BP). The Musqueam understand c̓əsnaʔəm to have been continuously occupied by generations of their forebears; despite decimation of the community by smallpox in the nineteenth century, it continues to be one of the most important ancestral villages and burial grounds in their traditional territory.

The c̓əsnaʔəm settlement first attracted attention as an archaeological site in 1884 when road improvements exposed cultural material and burials—in contemporary terms, Musqueam belongings and ancestral remains[29]—and it has since been relentlessly "mined" for artifacts and human remains by "archaeologists, collectors, and treasure hunters" (University of British Columbia Library n.d.). Under Franz Boas's direction, Harlan Smith undertook what was understood to be "salvage anthropology" at c̓əsnaʔəm in the late 1890s with the aim of documenting the migration of populations and the diffusion of cultural traits within the region and between the Pacific northwest and northeastern Asia (Roy 2016, 35).[30] Like most anthropologists at the time, they operated on the assumption that Indigenous cultures had disappeared, or were rapidly disappearing, and that the cultural histories of interest to archaeologists lie beyond the reach of Indigenous oral traditions so would be of little interest to contemporary Indigenous people in the region. In the case of c̓əsnaʔəm and the Musequeam, these assumptions were amplified by claims that had been published in 1895 by Charles Hill-Tout on the basis of material he collected from c̓əsnaʔəm for the Art, Historical, and Scientific Association of Vancouver. He maintained that "contemporary Aboriginal residents were relatively recent newcomers to the area"; the original inhabitants of c̓əsnaʔəm, a pre-Salishan people who had occupied villages throughout the Lower Fraser River region, had been "displaced or exterminated" by a "hostile people" who had migrated into the region from the interior (Roy 2016, 32, 107,113). Hill-Tout's interpretation was informed by the racialist assumption that "primitive peoples such as our Indians [are] deeply conservative" (n.d., as quoted by Roy 2016, 115). Their cultures are static, bounded, and unchanging so that observed differences in material culture, over time or across a region, must be attributed to differences in cultural tradition and identity which were, in turn, associated with racially distinct populations. Where c̓əsnaʔəm was concerned, Hill-Tout based his theory of population discontinuity on the claim that the shape of crania recovered from the site changed over time; he identified the hostile intruders as a distinct race of "broad-headed people," in contrast to earlier inhabitants characterized by "long skulls" (Roy 2016, 53).

Smith, working for Boas, interpreted these differences in cultural terms; he took long-type skulls to be the result of a practice of head-binding and, in his field notes, he reported a continuum in skull types; between the extremes of broad and narrow, he found "every conceivable intermediate form" (1898 correspondence with Boas, as cited by Roy 2016, 52). Nonetheless, in his report to Boas, Smith reiterated Hill-Tout's displacement hypothesis, concluding that c̓əsnaʔəm had been occupied by "two distinct peoples" which Boas interpreted as evidence of population migration. Although Boas emphasized the dynamism of local cultures—"the people of the North Pacific coastal region no longer appear to be unchanging, ahistorical entities" (Boas 1908, as quoted by Roy 2016, 35)—he too reproduced Hill-Tout's claim that contemporary Musqueam were descendants of an intrusive population. Contra established Musqueam tradition and understanding, the original occupants of c̓əsnaʔəm were not their ancestors.

Whatever Boas's and Smith's intentions were as anthropologists, this discontinuity thesis served to legitimate setter-colonial political interests and agendas in a number of ways. Roy observes that, in addition to dissociating contemporary Musqueam from key villages and sacred burial grounds in

[28]Marpole Midden, also known as the Eburn and Great Fraser Midden, was recognized early on as "one of the largest precontact middens on the Pacific coast of Canada"; it was designated a National Historic Site of Canada in 1933 (Parks Canada 2008).

[29]See the preface to *These Mysterious People* in which Jordan Wilson explains the significance of this terminology (Roy 2016, xxi–xxii).

[30]Smith's excavations at c̓əsnaʔəm were one component of the work of the Jesup North Pacific Expedition directed by Boas.

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their traditional and ancestral territory, it normalized the violent displacement of one population by another as a "natural process in *all* human settlement" which, in turn, legitimated ongoing processes of Indigenous dispossession by the Canadian state and settler population in the region (2016, 33).[31] As such, it is recognizably a variant of eliminationist ideologies by which Indigenous territories have been declared *terra nullius* in settler-colonial states around the world, in this case not by insisting that the land is literally unoccupied but by asserting that the territorial claims of Indigenous people resident in the region lack historical credibility and therefore cannot be accorded legal standing.[32] The "two-race model" introduced by Hill-Tout was reproduced and made vivid by midcentury cranial reconstructions created for display in the Vancouver City Museum (77), and it repeatedly resurfaced in legal rights and title cases well into the 1990s (32). This "commitment to disconnectedness," as Roy describes it (115), is explicit in the 1948 news article from which she takes her title:

> Who were these mysterious people who lived long ago at Sea Island at the mouth of the Fraser River? … They were not Indians certainly. (70)

4.b Borden and the Musqueam Indian Band

Crucially, for present purposes, these assumptions about Indigenous culture and history, and the settler-colonial interests they embody, set the conceptual framework for archaeological research in the region through most of the twentieth century. A call in the mid-1940s for "systematic, scientific" archaeological work on lower mainland and Fraser delta sites was taken up by a UBC-based scholar, Charles Borden, who later developed the site designation system still in use across Canada.[33]

Borden undertook a more rigorous and ambitious program of excavation than had been typical of his predecessors at a number of Musqueam sites from 1947 through the 1970s. Although these were often salvage operations prompted by encroaching urban development, his goal was to establish a standardized spatiotemporal system of Coast Salish cultural phases for the region. He was especially concerned that his predecessors had not systematically documented the stratigraphic sequence of cultural phases—the temporal distribution of distinctive assemblages of belongings and ancestral remains—that was presupposed by the narrative of displacement. Over decades, his fieldwork served to establish the central importance of c̓əsnaʔəm as a regional type site. However, despite building a richer and more detailed empirical basis for a site-specific and regional typology and chronology, and despite a growing body of evidence that occupation at c̓əsnaʔəm had been continuous for at least four thousand years—described by Roy as "complicat[ing]" his "recent settlement theory" (2016, 136)—Borden's culture-historical phase system for the region emphasized discontinuities. He posited a series of discrete, temporally and spatially bounded precontact cultures, recapitulating the conventional wisdom that an earlier "Marpole" culture (450 BCE to 500 ACE) had been replaced by a later immigrant culture, designated in his system as Whalen Phase

[31]An important feature of this regional context is that a Royal Proclamation of 1763 specified that treaties must be negotiated with Indigenous peoples prior to settlement however, with the exception of the Douglas Treaties (1850–1854) and an extension of Treaty 8 into northeastern British Columbia (1899), no treaties were negotiated with First Nations in British Columbia until the early 1990s. The territory that the Musqueam understand to be traditionally and ancestrally theirs was never ceded to the Canadian state.

[32]Similar strategies are reported in other settler-colonial contexts. See, for example, Simpson's discussion of claims of discontinuity that depend on anthropological concepts and conventions. As she puts it in a memorable passage, "concepts have teeth and teeth that bite through time" (2007, 69).

[33]Philip Drucker issued this call in his 1943 publication of an archaeological survey of the region (Roy 2006, 83). Borden was not trained as an archaeologist; he was originally a professor of Germanic studies at UBC who took up archaeology in the mid-1940s, and was only much later cross-appointed as a lecturer in archaeology. He shared Drucker's conviction that a "scientific approach" was the key to answering outstanding questions about the origins and identities of precontact peoples in the lower mainland.

https://doi.org/10.1017/can.2022.33 Published online by Cambridge University Press

II (Borden 1970). The existence of this phase was called into question in the early 1990s and is no longer widely used (Thom 1992),[34] but the basic architecture of the system persists, setting the terms in which archaeological sites and assemblages are described and compared, and also reported under the British Columbia Heritage Conservation Act that Borden was instrumental in establishing.[35] Roy makes the case that this program of archaeological research played a role in establishing and sustaining the settler-colonial "civic narrative" of dispossession that legitimated the dissociation of the Musqueam from their ancestral settlement at c̓əsnaʔəm and from their heritage in the region as a whole (2016, 33, 150).[36]

At the same time, a distinctive feature of Borden's practice was the relationship he developed with a number of prominent Musqueam families and community leaders. When he first proposed to run a UBC field school on Musqueam Reserve lands he faced stiff opposition. He ultimately secured permission through a process of negotiation that involved an effort on his part to inform Musqueam community members about his archaeological aims and practices, and he later encouraged their participation in his field projects. The Musqueam were by no means passive recipients of archaeological wisdom in this process; they engaged in what Roy describes as deliberate strategies of intervention by which they put the tools, evidence, language, and authority of archaeology to work for their own purposes (Roy 2016, chap. 5). Although Borden seems to have assumed, with Smith and Hill-Tout, that Indigenous oral history could provide little insight into deep-time cultural history,[37] he did come to recognize that contemporary Musqueam have a profound sense of connection to their ancestral villages and territory. He encouraged the Indigenous community members who worked with him to pursue their own interests in archaeology[38] and when, in the early 1970s, he was invited by the Musqueam Band to organize salvage excavations in an area where they planned a housing development, he celebrated the fact that this project was not initiated "for our own gain" but in response to "a request which has come *from them* and as part of the Museum Project *conceived by them*" (correspondence cited by Roy 2016, 141).[39]

[34]Thom observes that several times in the course of his career, Borden revised his interpretation of the sequence of cultural phases he published in his influential 1970 article "Cultural History of the Fraser-Delta Region," but he maintained the hypothesis that a migration from the interior accounted for the distinctive cultural formation he believed he had identified at the Whalen Farm site in 1949 and 1950. In his final article (1978, published posthumously in 1983) Thom notes that, responding to "heavy criticism from other scholars working in the area" (Thom 1992, 6–7), Borden characterized Whalen II as a fusion of Locarno Beach and Marpole cultures; he did not mention migration but did endorse a diffusion hypothesis. Thom concludes, on the basis of a reanalysis of the Whalen Farm collections, that this site should be considered a variant of the Marpole phase, its distinctive features likely reflecting seasonal occupation rather than the intrusion of a culture from the interior.

[35]Working with Wilson Duff, Borden played a central role in formulating and securing provincial legislation designed to protect archaeological sites: the 1960 Archaeological and Historical Sites Protection Act, and the Archaeological Sites Advisory Board. This was replaced by the Heritage Conservation Act of 1977 (Klassen 2008).

[36]Roy is careful to insist that she is not promulgating a conspiracy theory and explicitly rejects accounts that deny effective agency to Indigenous peoples who actively contested and appropriated Western modes of practice and authority (2016, 150–52). Although she does not use the terminology of coproduction, she shows how prevailing mainstream cultural values and social/political interests configured archaeological research and how, in turn, the authoritative "scientific" cultural histories produced by archaeologists—cultural histories that presupposed and embodied these values and interests—were configured by popular culture and legal, political discourse.

[37]The long-entrenched assumption that oral histories are irrelevant to archaeological inquiry has been sharply contested by advocates of collaborative practice. See, for example, Thomas (2000, chap. 23) for a general account of what can be learned from Indigenous histories, and Menzies and Martindale (2019) for a compelling rebuttal to a recent reiteration of the claim, in this case by Africanist historian Henige (2019), that the oral narratives of the First Nations of British Columbia are "not even hearsay."

[38]For example, Andrew C. Charles, a Musqueam archaeologist who worked with Borden in the 1950s, went on to conduct excavations at several other Musqueam settlements in the region; the "Charles phase" is named for him (Roy 2016, 135).

[39]Where the museum project he mentions is concerned, the Musqueam Band actively intervened when the Museum of Anthropology at UBC undertook to develop an exhibit that ultimately opened in 1996 under the title, "Written in the Earth"; see discussion of this collaboration below. A subsequent exhibit, hosted by Musqueam as well as by two other Vancouver area

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As Roy points out, this level of engagement with an Indigenous descendant community was virtually unheard of at the time (2016, 134). Borden did clearly privilege archaeological questions and interpretations as authoritative; "no doubt," Roy observes, he "had difficulty reconciling Aboriginal historical tradition and contemporary residency with his archaeological classification of cultural phases in the Lower Fraser Valley" in the face of mounting evidence that Musqueam settlements were continuously occupied, consistent with Indigenous oral history (Roy 2016, 135; see note 34). Nonetheless, he instituted practices that anticipate some elements of contemporary collaborative practice in archaeology where this requires active consultation, consent, reciprocity, and the participation of descendant communities. In this respect, Roy notes, Borden's practice represents a "turning point in the colonial culture of archaeology" (Roy 2016, 13, 151).

4.c Indigenous activism

By the 1990s, the association of c̓əsnaʔəm with the Musqueam was "automatic and unquestioned" (Roy 2006, 69); the "civic narrative" of dissociation that had been sustained in and, in part, by archaeology through the Borden era was discredited and there had been what Roy describes as a "shift towards mainstream recognition of First Nations cultures, histories, and geographies" (2016, 117). This she attributes to the emergence of an "anti-colonial, or reclamation culture" in Canada (2006, 93; 2016, 123,142), as well as the disciplinary reorientation she documents in terms of Borden's practice when in the 1950s and 1960s "salvage ethnography and archaeology responded to a sense of moral obligation that recognized the demoralizing effects of colonialism on Aboriginal cultures" (2016, 124). This reclamation-era "salvage" archaeology, which persists in many contexts and is, in some, embedded in heritage protection legislation, might have been "tempered by [a degree of] … charity," to invoke Sarton, but in privileging the interests of the settler state and the disciplinary research agenda of archaeology it was not humanized in the stronger sense he suggests when he urges a stance of "humility" with respect to the limitations of one's own science, and an active appreciation that the "thoughts and ways of other peoples" are scientifically relevant (1924, 21, 26). It is this latter shift in the values and aims of archaeological research that distinguishes the collaborative modes of practice that have taken shape in archeology since the 1990s, and that embodies the type of rationale for socially responsible science articulated by advocates of a robustly normative contextualism in philosophy of science: that scientific inquiry must be accountable to "sound social values, as well as sound epistemic values" (Kourany 2010, vii).[40]

A thriving tradition of collaborative archaeology that goes substantially beyond Borden's community outreach is now well established at the University of British Columbia. In recent decades, the "sense of moral obligation" Roy describes in connection with the midcentury "reclamation" culture had been reframed in terms of an explicit acknowledgement by the Canadian Archaeological Association (CAA) that "Indigenous Peoples have an inherent and unique relationships with their archaeological heritage," which entails that archaeologists must recognize and respect "Indigenous approaches to protection, conservation, and interpretation of that heritage": they must "learn and respect" Indigenous cultural protocols, and they must "make every effort to engage, cooperate, collaborate, and/or partner with the relevant Indigenous peoples and

museums in 2015–2016, was collaborative from the outset: "c̓əsnaʔəm, *The City Before the City*" (Musqueam Cultural and Educational Centre 2015; Museum of Anthropology 2015; Museum of Vancouver 2015).

[40]This is a running theme in Elliott's *Tapestry of Values* (2017), and it motivates Tuana's arguments for ethics-led research and policy design (2010). See note 46 below for further discussion of the philosophical rationale for stakeholder engagement.

In the context of archaeology, community-based collaborative modes of practice are often described as falling along a continuum with, at a minimum, respectful engagement (consultation, consent) at one end, through various grades of active participation to Indigenous designed and led projects at the other (Colwell-Chanthaphohn and Ferguson 2008).

https://doi.org/10.1017/can.2022.33 Published online by Cambridge University Press

communities" whenever their work concerns "Indigenous sites or sites that include an Indigenous component."[41]

In Canada, this was a response to intensified Indigenous activism culminating in the "tumultuous 'Indian summer' of 1990" when Elija Harper initiated the First Nations' challenge to the Meech Lake Accord and the Mohawk Nation of Kanestake set up a blockade at Oka to forestall the extension of a golf course onto ancestral lands they regard as sacred (Coulthard 2014, 115–17). The Royal Commission on Aboriginal Peoples (RCAP) was created in 1991 with a mandate to "investigate and propose solutions to the challenges affecting the relationship between Aboriginal peoples … [the historic nations of Canada], the Canadian Government and Canadian society as a whole" (RCAP 1996). This report was followed by another, "Gathering Strength," which set out recommendations for implementing the RCAP principles of "mutual respect, mutual recognition, mutual responsibility, and sharing" (Department of Indian Affairs and Northern Development 1998). A decade later, in 2008, the Canadian Supreme Court mandated the creation of a Truth and Reconciliation Commission (TRC) as one component of the Indian Residential Schools Settlement Agreement. Charged with documenting the history and legacy of the IRS system, the TRC issued its final report in 2015, along with ninety-four calls to action intended to "advance the process of Canadian reconciliation" (TRC 2015, 1). This report is a searing indictment of Canadian settler-colonial eliminationist policies and practices which, the Commission concluded, could only be described as a program of deliberate cultural genocide (TRC 2015). As contentious, uncertain, and radically incomplete as this process has been, the commitment to "surface truths" and to seek some form of (re)conciliation with Indigenous communities represents a significant step beyond the midcentury "reclamation" culture that Roy describes, at least with respect to public awareness of Indigenous demands for justice. It remains to be seen what tangible actions will follow.[42]

It is in this context that Indigenous communities are demanding respect for principles of self-determination with respect to their cultural heritage. In 1993, frustrated with the slow pace of rights and title cases and faced with yet another threat to c̓əsnaʔəm, the Musqueam Band purchased the Fraser Arms Hotel; a permit for development of this property had been approved even though it had been designated a national historic site in the 1950s (Roy 2016, 131). Again, in 2011–2012, they organized a vigil that ran for over two hundred days and successfully turned back plans for condo development on another area of c̓əsnaʔəm where ancestors had been buried and were being disturbed by construction.[43] The Musqueam Band currently employs a number of archaeologists whose mandate includes actively monitoring development projects and, although it is a constant struggle that is not well supported by provincial Heritage Act legislation, they routinely intervene to document, manage, and protect ancestral sites throughout their ancestral territory. One turning point in current relations between UBC and the Musqueam Band was the role that Musqueam scholars and knowledge keepers played in planning and producing a 1996 exhibit of archaeological

[41]The guidelines cited here are from the current Canadian Archaeological Association "Principles of Ethical Conduct" (CAA n.d.). They are informed by a "Report from the Aboriginal Heritage Committee": a "Statement of Principles for Ethical Conduct Pertaining to Aboriginal Peoples" prepared by Nicholson, Pokotylo, and Williamson (1996).

[42]Whether the TRC investigation has "advanced the process of reconciliation" (or could advance it) has been a contentious issue from the outset. Unlike contexts where truth and reconciliation hearings are part of a process of restorative justice following civil war, or transitional justice when an oppressive political regime is being dismantled and replaced, there has been no substantive structural change in Canadian rule of law or governance systems with respect to Indigenous nations. Critics of the "spectacle of reconciliation" (Daigle 2019) document just how hollow this promissory language is when it comes to Indigenous demands for sovereignty, self-determination, and reparation for appropriated lands and resources (e.g., Coulthard 2014; Tuck and Yang 2012). As the government of Canada moves to implement the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP 2007) that it endorsed in 2016, demands for concrete action on the RCAP and TRC recommendations are again intensified.

[43]Roy discusses the Fraser Arms Hotel purchase (2016, 16), and the 2011–2012 vigil is documented in a film available on the Knowledge Network, "c̓əsnaʔəm: The City Before the City" (Tailfeathers 2017). It is also described here: https://evelazarus.com/tag/musqueam-indian-band/.

https://doi.org/10.1017/can.2022.33 Published online by Cambridge University Press

material from southwestern British Columbia for the Museum of Anthropology (see note 35). Under pressure from the Musqueam Band, their representatives were involved as "full partners," not just invited to consult on the details of interpretation once the project had been conceptualized. Co-curators Margaret Holm and David Pokotylo (1997) describe this collaboration as transformative. The result was a significantly different exhibit than originally envisioned; *Written in the Earth* was framed in terms of First Nations heritage as much as archaeologically defined cultural histories (1997, 39). Reflecting on this process, Holm and Pokotylo remark that it "required us to reassess our professional values, terminology and cultural biases in order to respect the philosophy and perspectives of First Nations" (39). This point generalizes to collaborative partnerships outside museum contexts; the advocates of community-based and Indigenous-led archaeological research often remark that, to translate good intentions and abstract policies into effective working relationships, archaeologists must relinquish their role as "sole experts" (41); control over the goals and products, conduct, and authority of archaeological research that have long been jealously guarded as a disciplinary prerogative must be redistributed among partners (Atalay 2006; Wylie 2015, 194).

4.d Indigenous/Science

At the University of British Columbia these principles are central to a number of ongoing research programs that have been developed in partnership with Indigenous communities in the region,[44] and they were the motivation for forming "Indigenous/Science: Partnerships in the Exploration of History and Environments," a research cluster founded in 2018 that builds on this tradition of practice. Its goals have been to convene a network of UBC-based researchers from a range of fields—archaeology, ethnography, education, legal studies, linguistics, history, molecular and chemical analysis, geology, applied ethics and philosophy—who share a commitment to find ways as researchers to take up the TRC calls to action and "do more than just *talk* about reconciliation" (TRC 2015, 21; Indigenous/Science 2018).[45] In the spirit of cultivating partnerships centered on questions that Indigenous communities identify as relevant, representatives of the network reached out to a number of regional First Nations and asked if the expertise of its members might be useful to them. In the event, all the communities contacted identified projects of interest, most to do with identifying the materials used to produce Indigenous belongings, determining where these may have originated and traveled, and reconstructing on this basis patterns of settlement, cultural interaction, resource and landscape use.

When Indigenous partners set the research agenda, the questions they raise do not presuppose—indeed, they often call into question—the assumptions about Indigenous cultures and histories that have framed archaeological inquiry from the time of Boas's Jessup expedition through Borden's

[44]These include, for example, Michael Blake's long-term partnership with the Stó:lō Nation; Sue Rowley's ongoing work with the Musqueam Band and with a number of other communities involved in MoA projects, including the museum's "Reciprocal Research Network" and repatriation program, "The Journey Home" (Rowley 2013); a field school that Andrew Martindale directed for the Musqueam Band, his on-going research program with Tsimshian communities, and ground-penetrating radar surveys for unmarked graves undertaken with Eric Simons for the Penekalut Tribe (Simons, Martindale, Wylie 2021). A number of other archaeologists in the region—based at universities, working for Indigenous communities and for culture-resource management firms—are actively engaged in collaborative projects. George Nicholas, at Simon Fraser University, led "Intellectual Property Issues in Cultural Heritage," a seven-year SSHRC-funded initiative that brought together an international network of cultural heritage researchers involved in collaborative practice: https://www.sfu.ca/ipinch/.

[45]This passage from the TRC report reads: "Together, Canadians must do more than just talk about reconciliation; we must learn how to practice reconciliation in our everyday lives—within ourselves and our families, and in our communities, governments, places of worship, schools, and workplaces. To do so constructively, Canadians must remain committed to the ongoing work of establishing and maintaining respectful relationships" (2015, 21).

I joined this network when I returned to Canada and was appointed to the UBC faculty in 2017. I served as its co-PI for the year it received UBC funding (2018–2019), and I currently participate in several projects that have grown out of the network initiatives described here.

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midcentury salvage archaeology.[46] This includes the preoccupation with temporal and spatial discontinuity, and the presumption that Indigenous cultures are tightly bounded, highly conservative sociolinguistic units tied to discrete geographical locations. It is telling that Andrew Charles, a Musqueam archaeologist who worked with Borden, is quoted by Roy as observing that "culture is always in transition"; the lens through which he viewed the Musqueam history of occupation at c̓əsnaʔəm is one of dynamic continuity. His understanding of Musqueam's relationship to their ancestral territory is similarly expansive; rather than localized to a particular village or cluster of settlements, Musqueam connections extend through a "far-reaching network of genealogical ties" that connect them to other Indigenous communities throughout the region and to their ancestors (Roy 2016, 135).[47] One of the Indigenous/Science projects now under way in partnership with the Musqueam Band, "Splitting Obsidian," documents these regional relationships in archaeological terms.

4.e Splitting Obsidian

This project was initiated by Rhy McMillan, then a PhD student in geological sciences, working with Dominique Weis and the research team affiliated with the UBC Pacific Centre for Isotopic and Geochemical Research (PCIGR) which Weis directs. In a meeting with Musqueam Band representatives in 2018, McMillan and Weis outlined several types of analyses they could undertake of obsidian belongings held on behalf of the Musqueam Band in an archaeological repository at UBC. Obsidian, a form of volcanic glass, is especially durable and chemically stable so, in principle, its chemical profile could be used to identify the most likely sources of the material from which the Musqueam belongings were made (McMillan, Amini, and Weis 2019). One technique McMillan could offer was nondestructive but relatively low-resolution, while another that would allow for a more accurate multivariate analysis of trace element composition and lead isotope ratios would require the extraction of physical samples from the belongings.[48] Holm and Pokotylo had made a request twenty years earlier to "drill small holes in a few artifacts" so they could use Accelerator Mass Spectrometry (AMS) radiocarbon dating to determine the age of material they proposed to include in the "Written in the Earth" exhibit. In the process, they confronted a fundamental difference between the way they, as archaeologists, and their Musqueam partners value "heritage artifacts" (Holm and Pokotylo 1997, 36). From a Musqeuam perspective, whatever information might be gained by destructive testing was not worth the risk of compromising the intrinsic value and spiritual integrity of these ancestral belongings.

[46]This critical perspective on the taken-for-granteds of disciplinary research is routinely identified as a crucial strength of community-based collaborative practice and participatory action research in a wide range of fields. I've described some of these parallels in the context of articulating a standpoint theory rationale for "extending duties of 'attention and response,'" as Longino puts it, not only to those who are marginalized within a research community but also to collaborative partners outside the research community (Wylie 2014, 80). Following Longino, this is an epistemic as well as a moral obligation, of particular value in enabling what she describes as "transformative criticism" (Longino 2002, 128–31; Wylie 2015, 10). Melo-Martin and Intemann (2011) provide a compelling illustration of these points in connection with HPV vaccine research, and they are central to the philosophical discussions of stakeholder engagement noted earlier in connection with programs for socially responsible science. Elliott, for example, describes how "'engagement' … [with] citizens, policymakers, scientists and other scholars" can enhance research in fields such as medicine, environmental pollution and toxicology, as well as the social and historical sciences (2017, 138).

[47]Echoing Musqueam elders and knowledge keepers, Roy suggests that rather than identifying as "exclusively 'Musqueam', or as exclusive residents of a single village," the ancestors of contemporary Musqueam would likely have "framed their identities in terms of social and cultural relationships among peoples as hən̓q̓əmiń əm̓ or multilingual speakers, and as members of webs of interconnected families and alliances that reach beyond village boundaries to much larger geographical, cultural, and spiritual spaces" (2016, 146).

[48]The first, lower-resolution technique involved the use of Xray fluorescence and Raman spectroscopy to assess elemental concentrations through analysis of structural characteristics of the material. The technique that would allow for multivariate analysis was split-stream laser ablation inductively coupled plasma-mass spectrometry (SS-LA-ICP-MS) (McMillan, Amini, and Weis 2019; McMillan 2020).

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Mindful of these concerns, McMillan and the PCIGR team proposed the use of split-stream laser ablation, a component of the second technique, which would make it possible to remove samples so small that the damage is barely visible to the eye; it results in craters on sample surfaces of just 89 micrometres in diameter. After consultation with the head archaeologist and Musqueam knowledge keepers and elders it was agreed that, given the nature of the belongings to be analyzed and the minimal samples required, this degree of destructive testing would be acceptable. To interpret the results of this analysis, McMillan and his colleagues drew on a substantial body of baseline data that provide geochemical profiles of the magma reservoirs that feed clusters of volcanoes along the northwest coast from Alaska down to Oregon, as well as the Yellowstone volcanics. They are careful to specify that although they cannot render a definitive positive verdict about where a sample must have originated, they can eliminate obsidian sources given these profiles. Their conclusion is that the obsidian belongings they tested could not have originated in the immediate vicinity of ancestral Musqueam settlements; they most likely came from volcanic flows in the Snake River Plain in southern Idaho, as much as one thousand kilometers to the south and east (McMillan 2020; McMillan, Amini, and Weis 2019).[49]

This is an exciting result for all concerned. The geosourcing study undertaken by McMillan and the PCIGR team bears witness to a network of connections spanning the region that Musqueam community members are well aware of, but that settler conceptions of property and property ownership have systematically obscured.[50] Roy traces the legacy of these assumptions in her genealogy of archaeological research at c̓əsnaʔəm, and they are foundational to the cultural typologies and culture-historical sequences that configure archaeological accounts of Coast Salish prehistory.[51] In this case, as in many others, Indigenous-led collaborative practice brings a distinctive set of values and interests to bear, humanizing archaeology in several senses. Most obviously, it reconfigures the aims of research by directing attention to new questions about the cultural histories of obsidian. This, in turn, required the geochemistry team to reassess standard geosourcing practices. The selection of a minimally destructive sampling technique was informed by Musqueam protocol, but the multivariate and multiproxy approach to geosourcing represents a methodological innovation. The laborious, technically demanding process of using multiple isotope ratios, rather than relying on a single trace-element proxy, might not be needed to address the questions that typically interest geologists and archaeologists intent on constructing regional cultural histories on a broad scale. However, it provides a level of resolution that is especially well suited to the questions about regional social networks and cultural histories that were the focus of a Musqueam-defined research program. This shift in aims is the motivation for several follow-on projects in which McMillan is now engaged with the Musqueam and other regional First Nations. Alongside the refinement of geochemical techniques, McMillan and several colleagues have developed an open-source statistical tool designed to support multivariate analysis of the data generated by these methods (McMillan et al. 2022). And because fine-grained baseline data are required for geosourcing projects that address questions about social networks and cultural

[49]I note that this technique exemplifies the principles of triangulation I describe above in connection with evidential reasoning; in this it is robust in the sense inspired by Wimsatt ([1981] 2012).

[50]In a nuanced appraisal of this disconnect between colonial and Indigenous assumptions, Roy observes that "Western models of property and ownership, which define a bounded group of peoples associated with a specific piece of land, do not acknowledge the fluidity and flexibility of Coast Salish systems of territoriality. At the same time, descriptions of identity as strictly relational or fluid, does not offer a satisfactory explanation of indigenous legal systems of ownership" (2016, 152).

[51]This finding parallels the results of a case I discuss in "A Plurality of Pluralisms" (2015): a collaborative and multi-disciplinary study of Kwäday Dän Ts'inchí, the remains of an ancestor that were discovered in 1999 melting out of a high-level glacier in northeast British Columbia. The traveller's dietary profile, clothing, and tools, and the results of a community DNA study, established that he had lived both on the coast and in the interior, confirming Indigenous understanding that there were traditional ties between interior and coastal communities. The broader significance of this ratification of traditional Indigenous knowledge is that it challenges the conventional ethnographic and archaeological assumption that "tribal identity" is geographically localized, rather than a "spatially extended network of family and clan affiliations" (Wylie 2015, 196–98).

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histories, McMillan is currently engaged in field surveys designed to identify geological sources of obsidian and other types of tool-stone in the region.

In short, far from encouraging pernicious forms of value influence that pose a threat to the "factual basis of science"—the "old worries" about fact construction that Kourany addresses—the shift in cultural and political values that motivates archaeologists to build collaborative partnerships with Indigenous communities often enhances their own practice with respect to its evolving "epistemic values." As Sarton would expect, learning about the "thoughts and ways of other people" (1924, 26) has the salutary effect of bringing a critical lens to bear on taken-for-granted goals and foundational assumptions, directing attention to a range of questions that had not been considered. And as aims theorists would expect, when purposes are redefined, researchers have to reassess what counts as evidence and recalibrate established methodological norms for gathering and analyzing it, a process that as often as not throws into sharp relief the limitations of research-as-usual, including conditions of adequacy of the kind that concern Brigandt. For decades, the results of archaeological research had been putting pressure on the "pre-understandings" (Bell 2015) that have structured regional archaeology and ethnology since the late nineteenth century; these insistently contrary "facts" have made a difference. But centering attention on questions that matter to the Musqueam Band and designing joint projects to address them—ones that are informed by Indigenous values, interests, and expert knowledge—promotes a much "keener realization of one's ignorance" (Sarton 1924, 21): where it resides, how it has arisen, what interest-specific limitations it builds into archaeological inquiry, and what possibilities lie beyond the horizons of established research programs.

Conclusion: Reciprocal humanizing

I suggest that Sarton's New Humanist ideals are today, almost exactly one hundred years on, more salient than ever, and that the modes of engagement with Indigenous partners that archaeologists have been exploring in recent decades reinforce many of the reasons he gave for "humanizing the sciences." I draw two philosophical lessons from these examples of collaborative practice in archaeology.

One is that they illustrate the central insight articulated by advocates of an "aims approach" to understanding the pervasive, constitutive role of values in science: that the constellation of cultural values and social interests that set a research agenda configure all stages and aspects of the research process, including the domain-specific assumptions and methodological norms of practice that define what counts as rigorous, credible scientific inquiry. Taking stock of these values, constructing critical genealogies that document originating aims and their fact-shaping effects, to use Kourany's terminology (2020), and, crucially, bringing other values into play, can make visible the limitations of taken-for-granted goals and norms of practice, reframing them in highly productive ways. The second is a specification of the humility that Sarton hoped his humanism would instill in the sciences: that if anything is central to, and defining of, scientific practice it is a commitment to hold its framework assumptions open to critical scrutiny—including ontological commitments and epistemic conditions of adequacy. To put this point in terms that call into question one influential line of philosophical thinking about science, we should not assume, with Boghossian (2006), that the norms captured by a "classical [Western, scientific] picture of knowledge" define what will or should count as authoritative norms of justification for scientific claims in all contexts, for all time. Ideals of epistemic transcendence are untenable; it is time to recognize the situated nature of scientific inquiry as well as its considerable power, and take responsibility for its aims-inflected partiality.

I add to these lessons learned from archaeological practice a point made in the early sections of this paper: if philosophy of science is to be fit for purpose—if it is to play a role in humanizing scientific practice in the expansive sense now envisioned by advocates of a thoroughly normative as well as social contextualism—it must itself be reciprocally humanized. The insights articulated by

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the various contextualist research programs that have taken shape in the last fifty years must be reflexively applied to our own confident presuppositions about what counts as philosophy as much as to what we assume about the sciences we study (Sample 2022). It is crucial to keep sharply in focus the contingency of goals and norms of that have taken on the status of "fixed and final doctrine" within philosophy. This calls for a resolutely nonideal program of philosophical inquiry in Charles Mills's sense (2005), along lines currently being explored under the rubric of "socially relevant philosophy of science" (Fehr and Plaisance 2010) and captured by Katie Plaisance and Kevin Elliott's taxonomy of "engaged philosophy of science" (2021). It requires that we cultivate in philosophy the virtues of "humility and charity" Sarton advocated for the sciences: that we learn from "the thoughts and ideas of other people," especially critical voices within philosophy and those whose ways of investigating and understanding the natural and social world diverge from our own, and that we attend to values and interests that have typically not been addressed by scientific inquiry. Finally, if we are to do this well, we will have to build our own collaborative partnerships with colleagues in cognate fields of science studies who have the expertise necessary to construct critical genealogies of scientific research programs, and with researchers and stakeholders who are engaged in transformative criticism of the sciences we study.

Acknowledgments. I thank Ingo Bridgandt for his editorial stewardship of this contribution to the *CJP* special issue, "Engaging with Science, Value, and Society," especially his patience through the difficult process of finalizing it. The advice from two anonymous *CJP* reviewers was invaluable, as was the detailed feedback I got from a number of the archaeological colleagues on whose work I draw. I learned a great deal from lively discussions of earlier drafts that I presented at meetings of the Philosophy of Science Association, the Society for Philosophy of Science in Practice, and the American Association for the Advancement of Science in 2020, and as the McDonald Institute Lecture and the Haldane Lecture in the spring of 2022. I hope I have done justice to the work of the colleagues whose work has inspired mine; errors, misunderstandings, and shortsightedness are, of course, entirely my responsibility.

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Cite this article: Wylie, A. 2022. Humanizing Science and Philosophy of Science: George Sarton, Contextualist Philosophies of Science, and the Indigenous/Science Project. *Canadian Journal of Philosophy* 52: 256–278, doi:10.1017/can.2022.33