Grooving matter(s): 'Taking measure' through touch

Kevin Pijpers

abstract

This paper investigates the ability of touching practices to measure. Thinking with touch highlights not only its ability to perceive, but also to affect and intervene in material contexts. Drawing on extracts from the author's research into archaeological excavation labour, this paper wonders how touch could do measurement in the sciences otherwise. Addressing measurement in terms of active practices of 'measuring' or 'taking measure' emphasises the lived time of scientists, as well as their bodily ability to switch between modes of measuring. The paper aims to elicit the temporal, bodily, affective and spatial intricacies of archaeological labour in the trenches, and contributes to critical ethnographic accounts on materiality, context, and comparison in Science and Technology Studies. In doing so, it takes material groovings in archaeological fieldwork as evocative acts of scientific measurement.

Introduction

This paper takes a 'leap of imagination' (Whitehead, 1978: 4; following Stengers, 2011: 22) in an experiment with science, matter, and measurement. It thinks measurement in terms of scientists', and in particular archaeologists', sense of touch. Proposing that human touch is most interesting to practices of measurement for its ability to perceive indigenously, that is, 'from the midst of things' (Howes, 2005: 6; Myers and

Dumit, 2011), thinking with touch redefines what it means to take measure. As a performative 'instrument' of taking measure, a touching body affects and intervenes in what it is set out to measure, which I take to be of incredible advantage to the responsible production of scientific knowledge. This paper takes 'taking measure' as the bodily homing in on the sensed objectivity of more and less everyday experiences of knowing.

Drawing on a sociological and anthropological strand in Science and Technology Studies, I propose that scientists' touch folds and re-folds affectual imprints and ex-prints between bodies, 'objects' of measurement, and worlds of attachments and detachments. Being in touch harbours a sense in which scientists' responsibility envelops the worlds of their practices, including their abilities to switch between techniques of measurement in relation to the changing environments of their research. Through what Joanna Latimer (2007) calls 'motility', these switches in techniques of measuring 'move the world'. More than simply an organ for sensory registration and one-directional perception then, touch knots together felt geographical intensities on the body with extensive worlds. It entangles the measuring body with the objects it touches on, transforming objects in the process of 'taking their measure'. Politically, this paper sides with a pre-modern idea of the sense of touch, which until the eighteenth century was understood as the master sense: '[touch] tests, confirms what sight could only perceive' (Jay, 1993: 35). Modern ideas regarding the production of knowledge through privileged distanced vision might have miss-measured the relation between the human senses and the makings of knowledge.

In order to clarify measurement as a dimension of scientists' sense of touch, this paper recruits descriptions (including one quotation and two photographs) from the author's ethnographic fieldwork at the archaeological excavation on the peninsula of Ardnamurchan, Scotland, in the summer of 2014. Touch is featured prominently in archaeological excavations, as it is archaeologists' prime sense of excavation labour, and crucial to the practical organisation of archaeological fieldwork (see Edgeworth, 2013). Archaeologists manually emplace nylon strings, which measure and differentiate between the inside and outside of trenches; water-proof

drawings are made by hand and pencil; worn-out trowels scrape away the top soil with a sense of precision; Simone the drone is steered overhead by software translating the haptic noise of human hands moving over the smooth screen of a tablet into signals of techno-scientific meaning. Measure-by-touch in archaeology is about more than physical touch, as it invites relations extending to other bodies and things. Drawing on Hannah Macpherson's (2009) research on blind people's sense of touch, as well as Mark Paterson's (2009) research on the geography of the felt body, I propose that the sense of touch for archaeologists is about the human body's place in the world, e.g. where the body plants its feet, and how it moves about, from where and when it takes measure of the atmosphere it is attuned (and attuning) to (Stewart, 2011).

By exploring the haptic dimension of knowledge making, this paper highlights an area of sensory resistance to stratified understandings of measurement. This sensory resistance entails thinking the sciences from the 'great outdoors' (Meillassoux, 2010); e.g. from their messy and un-measured fields. In this paper I argue for a fractal and relational concept of 'measurement' through touch, the senses and materiality, and in doing so this paper contributes to discussions on contextualisation and comparison within ethnography and Science and Technology Studies (e.g. Morita, 2014). It explores how archaeological fieldwork is contextualised in processes of *taking measure from within*, through what Karin Knorr-Cetina (1999: 170) calls the engrossing and entrancing quality of collective experimental work. This paper measures the 'weight' of this engrossing experimentality in the field, including how archaeology as an expert science becomes more strongly objective (e.g. Harding, 2016) by taking and re-taking measure.

Transforming contexts of experimental comparison

> [O]ne [problem area] concerns our present lack of understanding of the contemporary machineries of knowing, of their depth, and particularly of their diversity […]. (Knorr-Cetina, 1999: 2)

My fieldwork with archaeologists consisted of following their encounters with objects, people, and stuff in the environments of their excavation. I

employed an ethnography focusing on archaeologists' particular ways of knowing through experimental and experiential touch. Working alongside archaeologists at the excavation site at Ardnamurchan, Scotland, I asked questions and conversed with them about their activities on their practices, taking their physical touch and embodiment as metonymical points of entry into their conceptual thought, sensations and affects (cares, worries, hopes, desires, fears…), without separating the physical from the abstract or conceptual. This also means that I started conversations about their physical labour in first instance, and followed the conversations (and materiality of the excavation), wherever they led us. This voyage was material in the sense that the environment is material, both in terms of the microscaled 'soil', as in terms of the wider environment the excavation is situated in. Moreover, excavation labour also forms material as well as conceptual traces in historical sense; as a work in progress of understanding a material past up until the point that archaeologists started digging in it. Even so, one could argue that archaeology itself is invested in the future of the past events of Ardnamurchan in a contribution to knowledge about events having occurred there. This 'knowing' as a form of taking measure of the past is why archaeology is so interesting in this regard, and what led me to do research on it.

Alongside Knorr-Cetina (1999), I am therefore concerned with how archaeologists' touch contextualises their research practices and knowledge making. Her notion of *epistemic cultures* is apt here, as she discusses how the engrossment of scientists into their research is crucial for their ways of knowing. Archaeological fieldwork contains an epistemic culture (or multiple), which make up particular ways of knowing. Practices of excavation labour entail a related set of experimental exercises, designed also to draw archaeologists into relation with the environment and soil, and entrance them into their work. These practices *code* and *decode* the archaeologists' touch: e.g. how archaeologists physically touch on their sites and objects, how they are touched by their environments, and how they as such know.

In this context, archaeologist Matt Edgeworth (2011, 2013, 2016b) suggests that the relationality between landscapes and archaeologists working the

soil provides localisation and justification of their fieldwork from *within* their research practices. Edgeworth (2016a: 107, following Capelotti, 2010) speaks of the *archaeosphere*, a 'time-mobile and time-saturated' realm in recurring dialogue with as of yet unknown dimensions of pasts, grounded in soil and archaeological evidence. These unknown dimensions are approached by archaeologists, slowly and methodically brought into the known (the archaeological record) by touch and the senses. Archaeology then happens at the 'edge of the unknown' (Edgeworth, 2016a: 111), at the edges of a partially known history, in processes of haptic measurement. What is interesting is that in relating to this unknown both an abstract sense *of* and *for* history is included, as well as a very material and concrete sense for the landscape of an excavation site. In other words, archaeological practices should somehow attune archaeologists' touch to a partial history and landscape.

Atsuro Morita's (2014) paper *The Ethnographic Machine* describes such attunement as a dimension of ethnographic research. In his paper Morita draws strongly on Marilyn Strathern's thought on ethnography. Strathern (1992, 1996) situates ethnography as an 'evocative artifact' (Morita, 2014: 222), affirming that 'contextualization plays a pivotal role in mediating the conceptual and the empirical in ethnography' (*ibid*.: 230). I employ Morita's use of Strathernian ethnography and contextualisation here as a way to frame a contrast between ethnography as an 'evocative artifact' and archaeologists' sense of touch as ethnographic instruments of evocation and engrossment. In this sense, a recurring 'engrossing' term in Morita's paper is *awkward*: an affectual signification of how relations are being connected (and disconnected) by events of knowing. What is *awkward* about Morita's (*ibid*.) use of the machinic, and related to the sense of touch and taking of measure I am describing here, is how his 'expanded notion of machine as a connectivity traversing the inside and outside of objects' can 'help... us consider the relation between those internal and external connections' (*ibid*.: 225). In other words, ethnography could be a machine to 'take measure' of epistemic cultures like archaeology, and their times and places, through the occasional awkward effect of connects and disconnects between ethnographer and object.

In relating Morita's (*ibid*.) ethnographic machine to Knorr-Cetina's (1999) epistemic cultures, as well as the measuring touch of archaeologists, I propose that interruptions (in the form of sometimes awkward connects and disconnects) of varying intensities occupy a constant, contingent, and affective dimension within empirical research. 'To take measure' is then not just a way of turning the noun 'measurement' into a verb, but rather to emphasise the significance of the lived time of i.e. archaeologists and other experts in their fields, and the connected ability to compare their findings 'from *within* without drawing on any external scales' (Morita, 2014: 229). During my fieldwork with archaeologists I have seen archaeologists continuously interrupted by findings (or lack of expected or hoped-for findings). These interruptions seem to serve as affective impulses to transforming bodily attitudes and continue excavating; a retaking of measure of the objects of their labour and knowing in process.

The lived time of taking measure by switching

I turn next to my ethnographic research with archaeological excavations to expand on the notion of taking measure through touch and engrossment.

> I am one of those, put me at the edge of a trench and I think I know what is happening, but put me in the trench and I 'just know'. Or at least that's how I feel. (David, 2014, email correspondence)

This extract from my conversations with archaeologists signifies the tacit and bodily dimension of taking measure in archaeological fieldwork. David highlights a difference between being put at the edge of the trench, and being inside of it. I propose that the difference between being inside and outside of the trench is here not a matter of simply achieving a better perspective, or closer look, at what is going on in a trench. My continued conversations with David highlighted not so much the qualitative difference between his ability to 'just know' when inside the trench versus 'thinking to know' when outside of the trench. Rather, I would argue it is this movement from outside, to inside, calling on a 'reason of haptic measure' within the ephemeral and tacit quality of his bodily knowing. There is a process of 'world-shifting' (Latimer and Munro, 2009: 8) going on in this movement of

re-taking measure of the trench; a switching of attachments and belongings to David's body with his movement through the field site, and inside and outside of trenches. This shifting of the world generates descriptions on how archaeological knowledge is made by taking measure of a trench. I want to emphasise here how David's switching between standing outside of the trench ('I think I know') to inside of the trench ('just know') to gathering some sort of measure about his knowing ('that's how I feel') is important for the way he takes measure of the trench in an embodied sense.

In other words, there is an increase in David's stability of knowing when moving along these lines of knowing and feeling. While inside the trench, so close to the earth, there is a sensory myopia going on. Invoking a sense of incommensurability – of becoming part of a particular place, this myopia makes comparison or scale to an outside rather difficult. My observations and discussions with archaeologists show that one has to work from inside a trench in order to get a measure of its significance – and the significance of its potential contents. Drawing on Latour (2004), being intimate with the soil teaches archaeologists how to become more articulate by being affected by the chaos of residues and traces of the past, which in turn instigates the desire to organise and re-organise the trenches, e.g. in the process of switching measures. Matt Edgeworth's (2016a: 111) 'edge of the unknown' describes the threshold between the dark loam the unknown objects reside in, and their emergence into the 'human sphere'. David shows this is not a one-directional movement, but instead how archaeologists are drawn by their sites to switch between vantage points across different edges, increasing the complexity of their descriptions of the soil over time.

This edge emphasises the archaeologist's ability to take measure of the soil and the historical objects in it, by means of a switch of David's living body from inside to outside, to inside, following different archaeological techniques of observation and intervention. This switch questions any unilateral direction and movement of the archaeological knowledge machine. Rather, any progressive and linear movement from unearthing of the trench, to object in the soil, to object of analysis and knowledge, and perhaps to finished object in a museum, fold backwards into the materiality of the landscape, and the bodies of archaeologists. This vicarious movement

of touch as a sense of measure has a clear temporal dimension. In the words of Dan Hicks (2016), archaeology is the temporality of the landscape revisited. This notion of revisiting the landscape un-conceals what is often taken for granted in both practices of scientific knowledge creation, and in practices of measurement: *that time spent taking measure is time lived*. Hicks (*ibid*.) tells us that, for archaeology, this temporal period of intervention is present in revisiting the landscape, that is, in switching, re-turning, re-collecting, re-membering, and adding layers of understanding to an 'archive'. Techniques of archaeological fieldwork, in other words, groove the material history of the trench, and allow archaeologists to re-visit, and re-measure, a particular part of a grooved trench in different ways.

Demands to 'take measure'

Image 1: Archaeologist Glenn, at the Ardnamurchan Transitions Project in 2014.

This trench (image 1), a presumed neolithic grave, was of great concern to the archaeologists involved in its excavation. The large upright stone on the left side of the picture was discovered cutting across the larger site of excavation, protruding from the designated field site into the 'non-archaeological' part of the landscape. The stone got out of line, unruly, as it ventured out of the large trench into the epistemologically dark and obtuse 'wilderness': permission to excavate the lower half of the trench, just below Glenn's trowel, had not been granted by Historic Scotland, the government agency in charge of preserving and caring for Scottish heritage until 2015. It took some days to get permission to excavate this trench, but archaeologists do not have days to waste, waiting for permission. Beyond the potential waste of time of obtaining permission however, doubts festered whether it was at all desirable to excavate this particular trench: its location so close to the surface led the archaeologists to hypothesise that grave robbers might already have emptied the spoils hundreds of years ago. The need for permission, the limited time for excavating, as well as the possibility of an empty grave mingled, and led to doubts and anxiety: their labour would perhaps better be spent elsewhere – the cost to excavate this trench might be too high. The 'cost' of the excavation was being measured by felt affects and a sense of time. Importantly, taking measure of such 'cost' happened within a temporal intervention of archaeological labour, internal to the excavation. The 'costs' here are measured affectively, and are therefore not deductive, but instead affective 'gains' of sensing and knowing the excavation site.

It is crucial to note that these affectual constraints, surrounding the particular trench, and its place in the larger excavation, vicariously circulated between bodies of archaeologists, and the large upright stone in the unruly trench. These constraints constitute the relational interplay between the trench, the archaeologists, trowels, and Historic Scotland, and were in no way easily or quickly 'solved'. Glenn, and his colleagues involved in excavating this trench had doubts, formed by their desire for a response from the site, e.g. that it would return some concrete result, which could affect the archaeologists in an archaeologically meaningful way. What 'archaeology' means at this point is then decidedly undecided: rather, the

mingling of constraints occurs in the process of 'measuring'. Their bodily practices switch continuously, in the process of addressing these constraints. The mingling of doubts, time pressure, and bureaucracy constituted the tenacity of the hold archaeologists have on this trench. Furthermore, the hope to continue their excavation of the area in years to come also relies on continued justifications of the archaeological measuring of a site. So it is not only the past, and the present, which are of concern, but also the future. The encounter with the upright stone itself, including the totality of its affects, makes the trench, its archaeologists, as well as what we continue to call 'archaeology'. At this point, the encounter between upright stone and archaeologists did not so much lead to a possible choice on whether or not to excavate. The relationality between bodies – e.g. stone and archaeologists – infused by the material encounter, instead *demand taking measure*. As such the lack of time, anxiety, and potential refusal of Historic Scotland were conditional constraints set by the encounter, which brought into becoming a relationality of measure between archaeologists and the stone. Even though not-yet-archaeology, bodies who do not know yet are affected by this variety of constraints, which cannot be taken as separate from the excavation practices themselves. There is, in other words, a society (see Shaviro, 2007) made here, involving bodies of archaeologists, their tools, the stone, time, and the possibility of doing interesting archaeology.

Image 1 reveals more subtle ways of the demand to take measure within this society, as it shows Glenn just starting a cross-section. Cross-sectioning involves only excavating a quarter, or in this case half of a trench, while leaving the other half untouched. In the words of Glenn, cross-sectioning means 'messing up one half so we still have the other half' (field notes N1). As it is impossible to excavate the site a second time, cross-sectioning is a precaution to continue the excavation in the case of accidental destruction of one of the two parts. Cross-sectioning 'cakes' the trench by means of a transversal cut, allowing archaeologists a view at different stratigraphical contexts from the side, and within the trench. As a technique, it enables contrasts to occur *in profile* and in pace with stratigraphically unearthing each section. The technique enables continuation of the excavation, black-

boxing part of it as untouchable, while simultaneously making possible a touching on the trench. Cross-sectioning is therefore a technique of keeping one part distant, and making the other part excavate-able, and therefore of revisiting the landscape in a different way. In doing so, archaeologists establish themselves as 'keepers' (Heidegger, 1971; Latimer and Munro, 2009) of the trench, by means of the archaeological technique of cross-sectioning, to continue an ongoing series of 'measure taking' by their sense of touch. Cross-sectioning finds new patterns, colours, textures, and new ways of engaging with the site. In this sense, it seems that cross-sectioning is not only a technique to carefully continue the relation with the site. It is also speculative, in the sense that it endeavours to make both bodies of archaeologists as well as excavations able to respond in new ways. Even if 'nothing' of interest is found as was indeed the case when Glenn and some of his colleagues finished the cross-section, the technique still enabled a continuation of the excavation work, and a revisiting of the landscape.

I propose here to understand 'taking measure' as the grooving of the relationship between Glenn, archaeologist, and trench. Grooves are present between the outside and inside of the trench, as well as between findings from the field and purified knowledge, which maintain the contingency that there are always additional things to say, new data sets to fabricate, more knowledge to add, and new measures to take. Knowledge in the form of conference proceedings, articles and monographs therefore, cannot foreclose or conclude the site of archaeological excavations as a finished process. Archaeologists of the Ardnamurchan Transitions Project do return to the excavation over multiple years, and even though they generally excavate different areas each year, they occasionally return to the same trench for further excavation. This yearly revisiting adds to an overlap of partial connections (Strathern, 1992), and a learning and re-learning to be affected by differences of the field site.

Measuring the groove between 'something' and 'nothing'

Image 2: The cross-sectioned trench with an upper and lower part. The upper part is the part in progress of excavation. The lower part is the part kept 'pristine'. And yet, in re-taking a measure of the trench, a specific cut was made in the lower half of the trench.

Image 2 features a photograph taken of the same trench, a few days later, after it has been cross-sectioned. In image 2, the cross-section is drawn horizontally across the middle of the trench. Initially, archaeologists set out to excavate only the top part, leaving the bottom part intact. The groove of the cross-section here determines a temporary status of the two parts. The upper part, which is manipulable and workable, is also fabricated as 'social' in terms of the entanglements occurring between archaeologists, the soil, the stones at the bottom, and generally knowledge extracted in touch with the part. The bottom part is fabricated as (temporarily) untouchable, and only sense-able by means of its side-view. Cross-sectioning might allow for a more modern conception of science, e.g. the separation between its 'natural' dimension of the untouchable part, and the social dimension of its

manipulable part. However, both the 'natural' and 'social' parts are constituted because of the act of cross-sectioning the trench in its entirety. This groove then does not constitute an absolute, one-directional edge.

After days of excavating, the trench turned out to be empty of archaeologically interesting objects. However, as image 2 shows, different contexts were in fact found in the trench. The difference here between 'nothing' and 'something' is a particular groove in the taking measure as well, related to the difference between what archaeologists say they do, and what actually ends up happening in relation to the excavation. Or, in other words, the distinction between 'nothing' and 'something' relates to the difference between what is archaeologically valuable, and what is not valuable, and therefore remains 'unmeasured'. A more material groove is present between the inside and outside of the excavation territory itself, where archaeologists jump inside the trench, and experience it as a singularity, a world on its own. These grooves are then, again, not bifurcations, but instead they are transgressed continually as they affect the bodies involved in them. Thinking with grooves allows more in-depth descriptions of the switching of positions (Latimer, 2007) between 'something' and 'nothing'. For instance, supervisor Beth asked her fellow archaeologists, during the excavation of this trench, to 'have faith that there is something in the [walled storage pit]' (field notes F8), implying the later possibility to switch to material and conceptual relations, which could provide some degree of measure to their work.

Another interesting part of this picture is the furrow (the deeper excavated lower part on image 2). Glenn and his colleagues were attempting to figure out whether this furrow was a human intervention in the ancient monument, or instead an animal intervention by a rodent. In other words, they were trying to figure out if this was 'an intentional cut' or an unintentional one. Taking the decision to start excavating the bottom part however took hours, as in order to 'free the bottom for excavation', they had to judge the cross-section to be complete. The upper part of image 2 shows a combination of rocks, which signify the bottom of the trench, and the end of the cross-section. These rocks envelop the archaeologists, in the process of the rodent-question, with disappointment. 'I don't like the look of this',

Glenn reports. In their discussions on whether the proposed bottom was in fact the bottom, a line of thought was considered. First, the bottom of the trench did not look like a bottom, because the stones found on this layer were rather uniquely placed, possibly intentionally so – e.g. by humans. This could imply that the bottom was in fact the new top of another context. On the other hand, I was told by Glenn that the bottom does appear to be a bottom, as more and more solid rocks are found on the lower end of the trench. The bottom/top is in suspense in this moment, and with it the possibility of continuing bodily encounters with the trench. I have found this to be crucial to archaeological practices of knowing: their practices seem to be about crafting possibilities of practical continuity, not in terms of an increasingly more affected body (Latour, 2004), but as ways to figure out possible affectual recombinations. In other words, the *what if* question is important here: what if these stones signify a bottom – what if they signify a top? Under what conditions could the bottom be a top, or a bottom? How does either way allow us to continue? These questions frame how the process of continued taking measure develops.

These conditions of excavation, or in Stengers's (2011: 518) terms, the *hold* of archaeologists on the excavation, are subjected to continuous renderings (see Myers, 2015). In light of this, the notion to first plan (e.g. draw) this context, and then perhaps remove the other half of the cross-section was set in motion. Supervisors gathered and together it was decided that the stones visible in the upper part of image 2 were indeed the bottom of the trench. The thought process here was that the stone slabs on the sides were loosening, indicating that the stones on the bottom were used as a foundation for the grave. Yet, the archaeologists told me that it was unlikely that the stones on the bottom are in fact natural. The decision on what is a 'natural' ground surface or bottom is an archaeologist's measure of the particular trench. It is easy to imagine a different material definition of the bottom of the trench, if there would not have been a deadline, or frustration regarding time lost deciding on the nature of the rodent furrow, or if there would have been multiple significant finds in this particular grave. The ability of archaeologists to switch between descriptions, and with it, to

switch how they 'take measure', frames how they continue the excavation, and their labour.

Contrasting methods

Archaeologists touch stuff continuously, and they do so from an established practice with a history of teaching and professional training. My own modality of sensing was quite different, coming from a more continental philosophical perspective, which I learned almost exclusively from inside universities, libraries, books and articles, in which 'touch' is rather a mediating concept of the mind, than an immediate idea of physical attachments and detachments. As I joined archaeologists in their experimental work, I worked alongside them in physically touching soil, stones, and sturdy roots of plants populating the earth. In terms of 'grooving', the difference between my own (in archaeological sense) amateuristic and unguided touch, and the expert touch of experienced archaeologists evoked a powerful contrast. Even though I was instructed and assisted in my excavation practice by archaeologists, this contrast was felt not only in an attitude of my own *not-having-the-sense* of how deep to excavate, but also in an awkward attitude of *not-knowing* how to 'interpret' contrasts in the soil, or measurements done by levelling equipment, or mappings made by pen and paper. Touch as such offered a point of entry for 'taking measure' of archaeological excavation labour – as an awkward machine. Touch serves as a metonym to think from and within an outside, as well as a way to collaborate (with archaeologists) in a 'touching vision' of experience and knowledge, which is often neglected (Puig de la Bellacasa, 2009).

'Taking measure from within' inverts the modern idea of distancing measurement through externalised determination of the environment. Archaeological excavation labour inverts modern linear understandings of time, and it inverts distanced objectivity (i.e. through vision as primary sense) into a felt and bodily geography of objective affects. However, the socio-political environment of archaeology exists within a modernised academic system of external scales and contexts. This broader landscape

means archaeologists in the field need ways and methods to mediate between their craft of 'measuring from within', and external requirements. In this context, feminist archaeologist Alison Wylie (2002) discusses in the chapter *Ethical dilemmas in archaeological practice: The (trans)formation of disciplinary identity* the rise and existence of cultural resource management amidst the struggle for archaeology's identity, in which archaeology functions not as a set of expert practices, but in reduced ways to safekeep, and keep covered by soil, monuments and artefacts from destruction by capitalist ventures. Wylie describes aptly the many tensions between salvaging archaeological objects for the sake of safekeeping them, and archaeology as a 'systematic investigation of the archaeological record as a source of evidence, a scientific resource' (*ibid*.: 230), as well as the tension between anthropology and more positivistic approaches to scientific archaeology (Martinón-Torres and Killick, 2015).

Conclusion

This paper has explored 'taking measure' through touch in practices which contextualise archaeological knowing. Haptic practices give context from within to archaeology's epistemic practices. Rather than evoking finished and distanced results, the touching techniques and visions (Puig de la Bellacasa, 2009) of bodily practices show that 'taking measure' opens up lived time and space through the ways archaeologists switch between methods, and transform contexts of experimental comparison.

The aim of this paper has been to elucidate how the engrossment and entrancement of archaeologists, including the bodily, affective, temporal and spatial dimensions of their work, constitute (one of, and a part of) their epistemic culture(s) (Knorr-Cetina, 1999). Rethinking established notions of measurement, this paper has attempted to make scientific measurement an active process of 'thinking' (Stengers, 2011: 21). Taking measure actively grooves both affectual bodies of archaeologists, as well as spatial landscapes and temporal histories, and evokes a 'comparison from within without drawing on any external scales' (Morita, 2014: 229).

Thinking with touch and grooves in archaeological fieldwork furthermore retains movement to practices of measure. In archaeological excavations, grooves are material and affectual imprints and ex-prints, which are transgressed by bodies in processes of measuring more precisely what a trench is about. Furthermore, thinking with grooves emphasises the folding of additional (haptic, bodily, affectual, temporal, spatial…) dimensions into excavation work. The grooving of archaeological excavations shows how 'taking measure' gathers together bodies of archaeologists as well as the trenches of their research, folding and re-folding affects as anxieties, fears, awkwardness, worries, legal questions, as well as, importantly, the joy of excavating.

This paper speculatively concludes that affective practices of measure fold and unfold an intensive hold on the doings of science, and that 'taking measure' is crucial for the engrossment and entrancement of scientists, and therefore, for understanding how archaeologists know. Keeping alive a sense of wonder for the crafting potential of the sense of touch makes archaeological excavation labour political: archaeological fieldwork does more than extract artefacts from the field, and pristinely organising them in museums (see Kaulingfreks *et al.*, 2011), making them untouchable in the process. 'Taking measure' can then be understood in relation to the epistemic switches of archaeologists in relation to interruptions to their disciplinary practices, in which the untouchable part of the cross-sectioned trench becomes touchable – and vice versa. As described in this paper, the haptic relation between a 'touchable and excavatable' top in archaeology and a 'pristine' bottom allows for the possibility of a switch between techniques of taking measure. This paper has argued that these switches are necessary to renderings – or rather bodily groovings – of taking measure.

references

Capelotti, P.J. (2014) *The human archaeology of space: Lunar, planetary and interstellar relics of exploration*. Jefferson: McFarland.

Edgeworth, M. (2011) 'Excavation as a ground of archaeological knowledge', *Archaeological Dialogues*, 18(1): 44-46.

Edgeworth, M. (2013) 'Archaeology's way of opening the world', in A. González-Ruibal (ed.) *Reclaiming archaeology: Beyond the tropes of modernity*. London and New York: Routledge.

Edgeworth, M. (2016a) 'Grounded objects: Archaeology and speculative realism', *Archaeological Dialogues*, 23(1): 93-113.

Edgeworth, M. (2016b) 'The ground beneath our feet: Beyond surface appearances', in G. Mackert and P. Petritsch (eds.) *Mensch macht Natur. Landschaft im Anthropozän*. Berlin: Walter de Gruyter.

Harding, S. (2016) 'Précis of Objectivity and diversity: Another logic of scientific research', *Philosophical Studies*, 174: 1801-1806.

Heidegger, M. (1971) *Poetry, language, thought*, trans. A. Hofstadter. New York: Harper & Row.

Hicks, D. (2016) 'The temporality of the landscape revisited', *Norwegian Archaeological Review*, 49(1): 1-18.

Howes, D. (2005) *Empire of the senses: The sensual culture reader*. Oxford: Berg.

Jay, M. (1993) *Downcast eyes: The denigration of vision in twentieth-century French thought*. London: University of California Press.

Kaulingfreks, R., S. Spoelstra and R. Ten Bos (2011) 'Wonders without wounds: On singularity, museum and organisation', *Management & Organizational History*, 6(3): 311-327.

Knorr-Cetina, K. (1999) *Epistemic cultures: How the sciences make knowledge*. Cambridge: Harvard University Press.

Latimer, J. (2007) 'Creating text, analyzing text: A note on ethnography, writing and power', in *Ethnographic futures: Voice, politics, and representation*. Second Symposium on Current Developments in Ethnographic Research in the Social and Management Sciences, Keele University.

Latimer, J.E. and R. Munro (2009) 'Keeping & dwelling: Relational extension, the idea of home, and otherness', *Space and Culture*, 12(3): 317-331.

Latour, B. (2004) 'How to talk about the body? The normative dimension of Science Studies', *Body and Society*, 10(2-3): 205-229.

Macpherson, H. (2009) 'Articulating blind touch: Thinking through the feet', *The Senses and Society*, 4(2): 179-193.

Martinón-Torres, M. and D. Killick (2015) 'Archaeological theories and archaeological sciences', in A. Gardner, M. Lake and U. Sommer (eds) *The Oxford handbook of archaeological theory*. Oxford: Oxford University Press.

Meillassoux, Q. (2010) *After finitude: An essay on the necessity of contingency*. London: Bloomsbury.

Morita, A. (2014) 'The ethnographic machine: Experimenting with context and comparison in Strathernian ethnography', *Science, Technology, and Human Values*, 39(2): 214-235.

Myers, N. (2015) *Rendering life molecular*. Durham: Duke University Press.

Myers, N. and J. Dumit (2011) 'Haptic creativity and the mid-embodiments of experimental life', in F. E. Mascia-Lees (ed.) *A companion to the anthropology of the body and embodiment*. Oxford: Wiley-Blackwell.

Paterson, M. (2009) 'Haptic geographies: Ethnography, haptic knowledges and sensuous dispositions', *Progress in Human Geography*, 33(6): 766-788.

Puig de la Bellacasa, M. (2009) 'Touching technologies, touching visions. The reclaiming of sensorial experience and the politics of speculative thinking', *Subjectivity*, 28(1): 297-315.

Shaviro, S. (2007) 'Deleuze's encounter with Whitehead'. [http://ftp.shaviro.com/Othertexts/DeleuzeWhitehead.pdf]

Stengers, I. (2011) *Thinking with Whitehead: A free and wild creation of concepts*. Cambridge: Harvard University Press.

Stewart, K. (2011) 'Atmospheric attunements', *Environment and Planning D: Society and Space*, 29(3): 445-453.

Strathern, M. (1992) *Partial connections*. Walnut Creek: AltaMira.

Strathern, M. (1996) 'Cutting the network', *Journal of the Royal Anthropological Institute*, 2(3): 517-535.

Whitehead, A. (1978) *Process and reality*. London: Collier Macmillan Publishing.

Wylie, A. (2002) *Thinking from things: Essays in the philosophy of archaeology.* Los Angeles: University of California Press.

acknowledgment

the author

Kevin Pijpers was awarded his doctoral degree by the University of Leicester School of Business, in 2018. His PhD explores haptic encounters with archaeological knowing. His research interests are multidisciplinary, including the senses and organisations, social epistemology, Science and Technology Studies, archaeology, philosophy of science, and more broadly, societal and organisational change. He holds an MA in Critical Organisation and Intervention Studies, and a BA in Humanistic Studies, both from the University of Humanistic Studies in Utrecht, the Netherlands.
Email: kevin@pijpers.org
Twitter: @kevinpijpers