Toxic Landscapes: Excavating a Polluted World

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Introduction

Over the past 25 years, archaeology has adopted a more reflexive focus, acknowledging that the objects we study exist and have effects in the present while telling us information about the past. Studies of the heritage industry, archaeology and nationalism, and archaeology and colonialism have highlighted vital ways in which the objects archaeologists study, far from being inert channels to the past, are lively, political and potentially potent (Fotiadis 1993; Hodder 2000, 2002; Lucas 2001; Meskell 2002; Shanks and Tilley 1987). This paper proposes that we as archaeologists extend this reflexive turn outside of the realm of heritage and museums, specifically to questions of ecological harm and pollution. In other words, the toxic effects of human pollution can be productively approached as archaeological objects in order to trace back and recreate their histories of production, as well as simultaneously identify their ongoing effects within the present. This inception of archaeology of toxicity directly articulates with and builds upon other recent social scientific studies of climate change, human-environment interactions and human-nonhuman relations. In so doing, it shows archaeology's value as a discipline that focuses on long temporalities and the material constitu-

tion of the social realm in order to understand one of the most pressing contemporary political issues: ecological devastation and its social impact.

Following Shannon L. Dawdy's (2008) suggestion that archaeologists should take their methodological focus on the *longue durée* to better understand human-environment interactions in an era of climate change and environmental disasters, this paper suggests toxicity as an avenue to investigate the complex social and ecological effects of human-produced pollution. This project is not merely tasked with uncovering sites of environmental degradation: it also investigates the unique materiality of toxicity and the social implications of living with toxicants. Given the time depth of archaeology and the type of human-nonhuman relations that define toxicity, 'living with toxicants' or 'living in toxic places' cannot be understood by presuming that the social is a purely human domain. Instead, an archaeology of toxicity requires a notion of social interactions that allows space for non-human actors to be meaningful, active and politically relevant.

Toxic Communities

Recent work in anthropology, science and technology studies (STS) and political ecology has opened up and destabilized longstanding assumptions about human relations with the environment, including non-human animals and material objects (for example, Bennett 2010; Haraway 2003; Kirksey 2012; Kosek 2006; Latour 2005). These studies have critiqued the presumption of the social as solely the product of the human subject. They have also interrogated how connections and interconnections across materialities, plants, animals and humans can be thought of as social, political, valuable and ethical.

Despite the theoretical importance of this radical decentring, in many instances, important conceptual and political purchase has been lost. As Kim Fortun (2014) writes in her critique of Bruno Latour's grand vision to return agency to materiality, the actor network theory (ANT) salon—despite an incredible quantity of scholarship—has failed to produce any research that touches on salient political issues. Despite thinking with material agency, Latour and his crew have little useful to say about political issues, such as the horrors of capitalist industrialization and deindus-

trialization, poverty, exposure and environmental degradation (Fortun 2014). Instead, questions of material agency or non-human politics draw prominently on a liberal flattening of ethics, which merely offer an inclusive expansion of rights for different hierarchies of non-humans, rather than interrogating how differences and inequalities are produced or how different types of beings constitute one another (Mendieta 2010). This connection between a decentred notion of the social and an anemic liberal politics underlies a fear within the broader social sciences that decentring the human subject necessarily evacuates politics from the investigation.

In an attempt to maintain political salience while investigating human-non-human interactions, anthropology, political ecology and STS have popularized the concept of toxicity (see Fortun 2014; Murphy 2006; Petryna 2002). These studies, which investigate the social impacts of toxic exposure on humans and non-human populations, as well as the ways in which local populations and experts develop methods of comprehending these exposures, highlight interconnections between environmental degradation, capitalist production, bodily sickness and harm and uncertainty. Toxicity, which refers to the harmful relationship between a concentrated human-produced substance and an organism, identifies how human-non-human relationships are always already intertwined with political economy.

Toxic exposure is both uneven within the bounds of a human population and unevenly distributed within a larger ecology of humans and non-humans. Therefore, toxicity provides an avenue for thinking about communities beyond the presumption of a nature/culture binary, particularly away from a concept of 'community' as an ideal that only exists within human minds, towards one that exists materially. The concept of toxicity challenges the Andersonian argument (2006) (and indeed rejects any Durkheimian or Rousseauian notion of the social) that it is the construction of an ideal, and a promulgation of an ideal, primarily via media and technology, that binds and defines a social community. Instead, toxicity focuses on the ways shared materials, interests and harms 'objectively' bind communities and how these community ties are identified and become meaningful as these materials, harms and interests become visible (Anderson 2006).

In John Dewey's (1927) theory of a 'community of interest', political communities emerge, not around consensus, physical adjacency or collective self-realization, but around a problem and relations of shared interest in reference to the problem––what Jane Bennett (2010) has defined as politics defined around the emergences of harms. Unlike 'imagined community' (Anderson 2006), community of interest requires no shared understanding among its members. Instead, members are brought together materially, with a connection based upon the relationship to a third object that poses a threat to all members of the community. These 'communities of harm' need not be solely human: they are formed around an object that can harm a fish as much as it can harm a human, either because both the fish and the human are exposed to the toxicant in their environment or because the human is exposed to the toxicant by eating the fish.

A toxicant, as a relational concept defined by its harmfulness, calls forth and assembles a community of living bodies to which it is harmful. It can emerge suddenly (the explosion of a nuclear bomb) or very slowly (the gradual concentration of dioxins in a stream and in the bodies that live in and use the stream). New community members may emerge or old ones may fall away as concentrations of toxicants change, accrete or dissipate over time or as everyday practices change. Analytically, these communities of harm do not necessarily precede or supersede all other kinds of community, but they do provide an alternative vehicle for understanding human-non-human relations across time, which can be thought of in tension with other human-centric notions of the social.

Toxic Temporalities

Thinking about toxicants as materials defined by their (harmful) liveliness provides a way of exploring how organisms are tied together by harms. Furthermore, it provides an optic into how these harms and the relations they produce are contingent upon the unique temporalities of toxic life: that is, the specific manner in which the temporalities of economic and social relations constitute and are constituted by the temporalities of toxic accumulation and dispersal (for example, the short-term planning of capitalist value creation alongside the long-term effects of mercury in groundwater).

While 'living with toxicants' may appear to be a relatively recent phenomenon of post-industrial or -nuclear life, it is a condition with a long history and therefore must be studied with an eye for long temporalities. Further, it must be studied in regard to the ways materiality instantiates certain temporalities (for example, the half-lives of radioactive isotopes or the amount of time it takes to disperse heavy metals from the body) and to the harms tied to these temporalities (for example, the damage caused by mercury in the body).

It is through these questions of materiality and temporality that ethnographic and historical capabilities become limited and archaeological study becomes productive and necessary. What I propose is an archaeology of toxicity that looks primarily at three things: firstly, the ways concentrations of toxicants produce different cycles of harm and violence at different temporal scales, via the co-production of human and non-human activity; secondly, the way these harms coalesce communities of humans and non-humans around shared interests, potential dangers and uncertainties; and, thirdly, the ways these communities live with the uncertainties that define toxicity.

One cannot identify a toxicant in isolation, given that toxicity refers to the characteristic of being harmful or damaging to a living organism. It is a necessarily relative category, always already referring to a substance that is toxic (for example, DDT) and something for which it is toxic (birds). According to Fortun (2001), toxicity refers to the properties of these microscopic objects as they interact with living bodies, defined by both a latent or active harmfulness and an ambiguity that makes it difficult to distinguish between the two. That is, while toxicants may kill quickly, the more common harm—what Rob Nixon (2011) calls slow violence—is through long-term exposure, in which toxicants accrete into the body, causing slow deaths, mutations and disease. Toxicity projects into the future, sometimes in the unbelievably *longue durée*, but always partially and open-endedly, never deterministically. It is a-teleological, harmful and always partially unknowable. Despite this fundamental unknowability—indeed, because of it—material specificity matters, and understanding histories of exposure and toxic sedimentation matter.

Both in terms of their accumulation and harm, as well as in the way they index past moments of dispersal, toxicants speak to the modes and rela-

tions of economic production and exploitation. Toxicants accrete in the body because lives and practices are recursive. Working in a coal mine or inhaling smog every day forces a sustained engagement with specific airborne toxicants that accumulate in the body. Bodies become sites of toxic sedimentation, tracing out lives lived in toxic places. These traces are universal as well as particularizing, pointing to the itinerant capabilities of many toxicants and the transporting capabilities of global capital, as well as the unique array of toxicants at a unique place in time. The accretion of these bodily toxicants indexes the social practices of bodies, particularizing the body materially even while tying it into a larger 'community of harm'.

While recent studies in STS have investigated contemporary modes of expertise and scientific mechanisms that engage and articulate with toxicants (Boudia and Jas 2014; Fortun and Fortun 2005; Tousignant 2013), there has been little work towards understanding how 'life with toxicants' takes place along with great time depth and at intergenerational temporalities. Certain heavy metals, such as lead, have an average biological half-life of 40 years, meaning it takes 40 years for a human body to effectively discharge half the lead concentration in one's bones. Other toxicants have widely variant biological half-lives: some last for hours, while others span decades. It is in these longer temporalities that an archaeology of toxicity becomes a potent mode of analysis. How does the emergence of a specific toxicant shape an emergent community of harm? How do different social practices, as well as the material specificity of different bodies, define different temporalities of harm? When does a group of fishermen near a runoff start to see a certain cycle of dead fish as related to a certain cycle of human sickness? What happens if this sickness takes place in 20-year cycles? Furthermore, what conceptual or material strategies emerge to deal with both the harms and the uncertainties inherent within that harm (for example, using a canary to test for gas in a mine)? Ideally, archaeology can trace the rise and fall of toxicants in an environment, the communities that coalesce and disperse there, changing responses to these ebbs and flows and the oscillations of both inter-human and interspecies relationships (for example, changing relations of humans and canaries).

Toxicants as an Archaeological Object

Archaeology has a long tradition of reconstructing the whole from the fragment, working backwards from traces to reconstruct some vision of a pre-fragmented life. Yet the archaeological record is not constituted by the sum of the 'real past' plus taphonomic distortions. These distortions are the history (Dawdy 2008). Given this, how are our relationships to these fragments changed if we view them, not merely as traces overdetermined by a single past, but as things that can be traced backwards as they enter and exit continually shifting assemblages in which they are active members? Instead of taking fragments as flawed representations, we should interest ourselves in fragmentation as an active process of dispersal, as opposed to mere disintegration.

For example, one of the most iconic yet unseeable objects in the archaeological record is the radioactive isotope carbon-14. For archaeologists interested in absolute chronologies, carbon-14 provides a chronologically consistent decompositional instability, providing a method to precisely measure how long it takes to perform its radical dissolution of a single half-life. Yet we fail to ask what this disintegration is doing. What if, instead of simply measuring carbon-14 to take us back to the moment of organic death, we took into account the fact that the carbon molecules are still doing things and have been doing things since this moment of death? Carbon-14 disintegration is a type of activity with effects in the world. What if, instead of carbon-14, we considered the plutonium-238 that surrounds the abandoned city of Pripyat, Ukraine? There, radiation is not a mute timekeeper, counting down days, weeks and months so that we might understand some linear time between now and then; it is an active disintegration, slowly fragmenting itself but, at the same time, actively harming surrounding organic bodies. In disintegrating, this plutonium constitutes its own assemblage of things entangled in its activity. To study this plutonium archaeologically requires both a focus on the effects of this radiation (past, present and future) and an analysis of its conditions of possibility, production and dispersal. In other words, it must be seen as an artefact as well as a toxicant.

Focusing on the effects of this toxic dispersal, however, does not preclude an analysis of a given object in which its disintegration is itself caught

up in a specific semiotic framework of meaning. In other words, interpreting these objects as toxicants does not simply require a materialist accounting of calculated harms and violences. Toxicants congeal traces that can be read by a surrounding community, and the way these traces have been read are no doubt part of the toxicants' effects in the world. The complex infrastructure of the scientific monitoring of radiation, folk wisdom concerning radiation and how to avoid it and new laws concerning victims of Chernobyl are all part of the history of this plutonium-238.

Radioactive molecules like plutonium-238 do things in the world: they harm things and they mutate things. This analogy need not confine itself to radioactivity. It is not solely the unique manner in which radiation acts over thousand-year half-lives and disintegrates over its existence that makes it an interesting subject of archaeology. What is notable is that, over its life, radiation interacts with the world in a manner that is directly toxic to a number of different organisms.

Methods

An archaeology of toxicity, therefore, is an archaeology of toxic accretions in bodies and the environment. Since archaeology, along with the practice of excavation, is a study of space over time, an archaeology of toxicity could also be thought of as an investigation into the living in and making of toxic place. In other words, how do the production and dispersal of toxicants into a landscape mediate how people, animals and plants make place, and how do varying exposures to these toxicants over time mediate relationships between these groups? This framework provides a means to identify and understand the socialities and politics of communities of harm in place, as they have coalesced and diverged over time and as they exist today.

Methodologically, the investigation of toxic place requires the search for specific known toxicants in the earth, in water or in bodies, alongside the search for the remnants of the lives of humans, plants and animals. Environmental tests of water quality or heavy metal concentrations can be used to connect contemporary and past toxicity, while paleoenvironmental reconstruction proxies like pollen and diatoms can be used to define changing ecological relationships over time. Combining these two

lines of data—environmental reconstruction and toxic concentrations over time—with more traditional archaeological data, concerning the location, complexity and concentration of human activity on the landscape, facilitates the understanding of how toxicants remake ecologies via shared harms and exposures. This remaking is not merely a question of environmental devastation, but it is also a question of how exposure to toxicants remakes how humans relate to their landscape and to the animals and plants that constitute it. This study of toxic exposure highlights how the specific materialities of toxicants manifest themselves over time and how these harms reveal shared interests across populations.

On the one hand, toxicity is not unique to the emergence of capitalism or industrialization; on the contrary, it has existed in different forms throughout history. Toxicity, imagined this way, could be used as a vehicle for understanding the long term effects of lead piping in Rome, coal use in the Song dynasty or mercury in early sixteenth-century Spanish-American silver mining. Part of archaeology's project is to build models of lives that are often forgotten or erased from history, that do not fit the hegemonic understanding of contemporary social or political imaginaries. Unpacking the impact of toxicants and the communities of harm they manifest serves as a platform for thinking of other possibilities for how populations in the deep past shared harms and social bonds with non-humans and, potentially, thought of themselves as part of human/non-human communities. Nevertheless, the emergence of a capitalist economy and industrialization has led to an astonishing fluorescence of toxicants, to the extent that organic life beyond toxicity is an impossibility.

An Archaeology of a Sacrifice Zone

The most obvious sites for the archaeology of toxicity investigation are intensely polluted industrial sites, from the chemical- and radioactivity-laden ruins of Chernobyl and Bhopal to the heavily polluted rivers surrounding the Old Chicago Stockyards. These sites, which Steve Lerner (2010) has called 'sacrifice zones', refer to spaces that have been contaminated with toxic pollutants and in which the environment and the population living in these spaces have been effectively abandoned by the state. Tracing and mapping toxicants across

time at these industrial sites uncovers how the toxicants have affected and harmed local populations over the past decades while revealing the history of the sites and the ways in which they are still harmful.

Mill Creek Ravine in Edmonton, Alberta, represents an example of a historic sacrifice zone. As a sacrifice zone, the history of Mill Creek Ravine cannot be understood through the normal historical periodizations of the area (Late Furtrading, Early Settlement, Early Industrialization and Late Industrialization). Instead, it must be understood through a more nuanced attention to cycles of production, consumption and ongoing toxic exposure. Long after the industry of the area was abandoned, the toxicants that defined Mill Creek Ravine continue.

Mill Creek is a large ravine running south-north on the south bank of the North Saskatchewan River. As Edmonton expanded with incoming settlers during the early twentieth century, Mill Creek became one of the central industrial areas of the city. The first railroad to connect Edmonton to western Canada was established along Mill Creek Ravine in 1902, followed by a fluorescence of meatpacking plants, brick factories and coal mines. At the very northern end of the ravine, a small, impoverished community of industrial labourers, known as Ross Acreage, was founded around 1905. Viewed as a squatters' shanty town, the community was ignored by the city and cut off from urban infrastructure, including access to clean water and sewers. While denied basic sanitation, it was also situated directly downstream from one of the most concentrated industrial areas in the city.

Drawing from the work of industrial archaeologists like Randall McGuire (2009) and Paul Shackel (2009), excavations in Mill Creek have focused on uncovering the community of Ross Acreage in order to investigate the untold daily lives of an impoverished and marginalized working class. Identifying the remains of two discrete shacks, these excavations have shown not only how this community constructed their homes and went about their daily lives, but how their strategies were defined in relation to the ever-increasing toxicity of their landscape. Mercury runoff from coal mines, animal waste from meat-packing plants and intense creek floodings from city storm drains forced residents to constantly relocate their houses, build homes on stilts and boil and filter their drinking water. On

one hand, the presence of new, industrially-produced consumer goods, such as mechanically-produced soda bottles, tin cans and industrially processed meat, shows the benefits of new industry. On the other hand, the thick layers of flood silt on top of occupation surfaces starkly demonstrate the drawbacks of living so close to unregulated industrial production.

The effects of this pollution on Ross Acreage lasted long after most of the industry was gone. While the community persisted until the 1950s, the viability of residential gardening plots was severely limited. Even though the entire community of Ross Acreage has been evicted, the city has spent the past 60 years trying to return Mill Creek Ravine to its pre-industrial state of natural health. During the 1970s, a 10-year clean-up transformed the ravine into a city park. This project, while laudable, has been continually frustrated by the long-term effects of early industrial pollution, as well as by the storm drain city infrastructure built during the 1920s. Indeed, Mill Creek remains the most polluted of all creeks in the Edmonton area (Stolte 2017). On a much smaller scale, the remains of squatters' coal ash throughout the northern half of the ravine continue to acidify the soil and leave it clear of grass.

While the complete results of the excavations at Mill Creek Ravine are too extensive to delve into in this short piece, the combination of environmental tests, such as heavy metal soil testing, with archaeological excavation provides clear value in determining how an impoverished community built its life in the shadow of industrial pollution. In the face of the ongoing drastic effects of industrial manufacturing, archaeology provides an optic onto the social and environmental costs and benefits of these effects, in the short and long term. As the speed of industrial production shows no signs of slowing down and, through the concentration and dispersal of pollutants, continues to project its effects far into the future, this optic is not only useful, but also necessary.

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