

Is Waste Indeterminacy Useful? A response to Zsuzsa Gille
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I thank Zsuzsa Gille for her thoughtful reply to my article "Knowing Waste: Towards an Inhuman Epistemology" (Hird 2012). I highly value Gille's waste studies scholarship, and especially appreciate Gille's comments on one of my preliminary forays into the phenomenon of waste.

Gille's response raises important concerns about my article, and in what follows, I hope to do some justice to these well-articulated criticisms. This response focuses on the discussion of indeterminacy, which is emerging as a key concept in my research on waste, landfilling, and bacterial liveliness. Before turning to this central theme, I want to acknowledge that Gille draws attention to my use of terms such as waste, trash, and garbage interchangeably throughout the article. I certainly understand that scholars distinguish these terms, and use them differently in different contexts (Hawkins 2006, Gille 2007). In 'Knowing Waste' I used the terms synonymously, partly in an attempt to signify the variability of the terms themselves: different scholars, government documents, industry reports, people working with waste, and so on use these terms in various ways that in turn affect the ways in which these phenomena are understood. I particularly like Gille's (2010) term "waste flows" because it succinctly captures my interest in landfill waste as a phenomenon in which human and inhuman relations — billions of diverse kinds of bacteria, engineers, gradients, regulatory bodies, clay, mass spectrometers and other technical devices, soil, paradigms, temperature, analytical sampling methods, pH, scientists, moisture, performance-based measuring systems, compression, graduate students, geosynthetic liners amongst myriad others — create and recreate "specific material configurations of the world" (Barad 2003, 814). Rather than determining each component that 'makes up' a landfill, I am interesting in exploring what Karen Barad terms the "agential intra-actions" through which phenomena come to be understood/made meaningful as components with definite properties and boundaries (ibid: 815). Barad's provocative theory of relationality pivots on indeterminacy, which I take up later in this response.

"So why the focus on landfills?" (2013, 3) Gille rightly asks. One of the limitations of 'Knowing Waste' was that I did not situate my interest in waste in the context of a study entitled 'Canada's Waste Flow' — a title inspired by Gille's own research (www.wasteflow.ca). 'Knowing Waste' is one of my first ventures into the study of waste, and is the outcome of an emerging collaboration with Kerry Rowe, a leading world expert in landfill engineering (see for example Rowe and Booker 2000, Skinner and Rowe 2003, Rowe et.al. 2004, Zhou and Rowe 2005, Meguid and Rowe 2006, Cooke and Rowe 2008). Before this collaboration, my primary interest was (and remains to a large extent) with bacteria, with which I engage within the theoretical framework of what might be called inhuman theory (see Hird 2009, Clark 2010). In several discussions with Rowe, and reading science and engineering research, I am learning to appreciate landfills as specific geographical spaces where bacteria 'meet with' the stuff humans discard (Haraway 2008). My focus on landfills, then, is not a consequence of hand-picking a phenomenon that makes indeterminacy "easier to prove" (since according to Barad's

(2007) agential realism theory *all* relationality depends upon indeterminacy): rather, it is the result of a serendipitous meeting with a world expert in landfill engineering who suggested a way for me to further my longstanding interest in bacteria, environmental concerns, and interdisciplinary research that engages social theory with the natural sciences and engineering.

Other scholars certainly explore places (such as the home) where "scientific modes of knowing are not hegemonic" (Gille 2013, 3), and other modes of knowing that concentrate on making waste determinate (see for example Barr, Gilg and Ford 2001, Riley 2008, Tudor et.al. 2011, Crang 2012). I allowed myself the leeway to focus on relational indeterminacy as a mode of knowing landfilling because these other modes of knowing are so thoughtfully researched. I have not yet come across detailed social scientific analyses of bacteria-landfill relationality, and the myriad environmental, human and inhuman health, political, social, and economic consequences of this particular relationality. Gille's related point, that theorizing waste in terms of its spatiality (Mary Douglas's 1966 theorization of "matter out of place" inaugurated this kind of analysis), needs to be justified because "landfills are where waste is no longer seen as out of place" (2013, 3) is a point well taken. I would simply want to add that this is one of the things that intrigues me about landfills; precisely that landfills are spaces where matter is ostensibly resolved and determined as matter 'in its place'. This out-of-sight, out-of-mind rendering determines certain stuff to *be* and *remain* waste, and belies alternate renderings, such as waste as lively and flowing metabolic resource.

I am interested in landfills for another reason: Canadians mainly deal with municipal solid, industrial, nuclear, and mining waste by burying it. These are diverse forms of waste to be sure, with their attendant and important specificities. Nevertheless, the vast bulk of this varied waste has ended up, and will likely end up in the foreseeable future, under the ground. Canadians also export increasing amounts of waste to other countries, where it is most often landfilled, sometimes in sites that are open, unlined, and include unsorted waste. For a Canadian, then, to study waste and *not* consider landfills would be, at minimum, a curious oversight.

With Gille, I certainly recognize other "modes of knowing" (2013, 2) waste occur outside laboratories (and field sites, waste management conferences, government meetings, corporate shareholder meetings and so on). Indeed, I have written specifically about Indigenous Canadian and Australian ways of living with waste, and suggest these modes of knowing as provocations for an ethical responsibility towards waste, a point I will return to later in this response (Hird 2013). I argue these ways of knowing do not deny waste's indeterminacy; indeed, *living with* waste within territorial spaces, bodies and so on (rather than, for instance, burying it) means to recognize relational liveliness across spaces and times that are resolved through different "agential cuts" (Barad 2003: 187).

If matter is indeterminate then "what", Gille asks, "is it that waste offers to our understanding of matter or to advancing feminist epistemology" (2013, 2)? 'Knowing Waste' is a first attempt to provide an empirical analysis of how particular cuts of always-already entangled relations resolve landfill waste as a determinate phenomenon.

My 'Waste Flow' team colleagues and I are currently tracing the ways in which human entangled relations — those of government regulations, industry representatives, disparate community groups, scientists, engineers, municipal representatives and so on — resolve waste issues in Canada largely in terms of technical 'fixes' (better landfills and incinerators, and waste-to-energy technologies) and governance (modifying individual citizens behavior in dealing with waste). In 'Knowing Waste' I wanted to expand these entangled relations to the inhuman, which meant better understanding how engineers and scientists engage with bacteria, soil, sunlight, geotextiles and so on to 'know' landfill waste. I am guided by Astrid Schrader's (2006) analysis of *Pfiesteria piscicida* that traces the cuts scientists make in rendering this tiny organism knowable. When scientists separate *P. piscicida* from their various metabolic and reproductive transformations (i.e., through *in vivo* culturing in laboratories), they produce nontoxic *P. piscicida*. It is not that scientists cannot determine anything about *P. piscicida*: it is that their inscription produces a new entity that leads to matters of fact. As Schrader puts it, "how you get to know a species experimentally cannot be separated from the...question of what they are." Different agential cuts establish different phenomena. This "cutting together-apart" as Barad describes it, produces phenomena. Scientific and engineering landfill research, Aboriginal ways of living with waste, Canadian household practices of waste 'management', and so on, exact different agential cuts that establish waste as particular phenomena. I am keenly interested in both understanding the specificities of these agential cuts, their temporality, and power as a force in these agential cuts. This is a way of getting behind or underneath (to perhaps adapt the landfill metaphor too far) statements that *determine* waste *as such*. Given that the regulations that do exist concerning waste (household, industrial, mining, bio-hazardous, and so on) are primarily informed by engineering and scientific research, I want to better understand *how* engineering and science practices determine, for instance, thresholds of 'acceptable' chemical toxicity in ground water.

Does this kind of analysis offer an emancipatory potential? I think this remains to be seen. As Gille warns, "embracing indeterminacy could not be more consequential and potentially more disastrous than in the field of waste studies and waste policies" (2013: 4). Certainly, social scientific analyses demonstrate industry, government, and interest groups either underplay scientific uncertainty by focusing, for instance, on short-term known risks — rather than long-term unknown or unknowable risks (where the very idea of a precautionary principle falters) — and/or use scientific uncertainty as an "obstructionist topos" to undermine or close debate and/or stall civic action (Walker and Walsh 2012: 6; see also Callon et al 2009; Campbell 1985; Hartnett 2004; Shackley and Wynne 1996; Smithson 1985; Zehr 1999). However, as these analyses also demonstrate, engineering and scientific uncertainty may also be effectively used to engage members of the public in debates about techno-scientific practices, policies, and regulation, as, for instance, Rachel Carson successfully did with *Silent Spring* (1962; Walker and Walsh 2012). Uncertainty, then — far from closing-down deliberation and discussion — may be effectively mobilized to open dialogue and decision-making to a much broader constituency (Kroll 2001; Lytle 2007; Revkin 2012; Wynne 2007: 108). As such, we require practical information about the uncertainties of established and emerging waste management technologies (be these 'sanitary landfills', incinerators, or waste-to-energy

systems such as bioreactors), and opportunities to consider society's complex socio-ethical relations with waste in order to situate waste in its wider context.

Inspired by Carson's path-breaking approach that emphasizes rather than diminishes uncertainty, my aim is to argue for a heightened ethical responsibility that attends the indeterminacy of modern practices of living with waste. Landfills are not only spaces where "waste is no longer seen as out of place" (Gille 2013: 3): they are also spaces where bacterial liveliness meets with soil, pH, sunlight energy, clay, moisture, and so on, as well as all of the stratifications of 'stuff' dumped into landfill cells. We simply have little idea of what bacteria will ultimately make of these ingredients (Clark and Hird 2013). Our subterranean waste disposal may, for instance, incite bacterial proliferation that involves the diversification and evolution of different kinds of bacteria. If there is fault here it is certainly not with the inhuman "material itself", as Gille (2013: 2) suggests 'Knowing Waste' states: responsibility is inherent to *every* agential cut with which waste becomes knowable to human and inhuman alike.

As such, the major ontological provocation here concerns our total dependence upon "life forms whose life-worlds and trajectories are likely to remain overwhelmingly unknown to us" (Clark and Hird 2013: 51). While landfills and other techno-scientific ways of dealing with waste may have profound consequences for human health and the environment, these life forms are largely indifferent to our (human) political machinations concerning waste. I am developing an 'ethics of vulnerability' (see Hird 2009 (chapter 7), 2010) cognizant of the fact that waste's indeterminacy does not privilege a particular politics. My aim is to detail the myriad agential cuts that make waste a phenomenon (including the various political affiliations that attend these cuts), and advance an ethical approach that forefronts both the known and imprescriptible (political, economic, socio-cultural, environmental, and health) implications of living with waste.

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