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Meeting with the microcosmos

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My current research attempts to build a microontology—engaging with sciences of the microcosmos—within biophilosophy (Hird, 2009). It is enlivened by Donna Haraway's contemplation about what can happen *When Species Meet*. In this short review, I hope to build on Haraway's important insights to contemplate meetings-with the Other in circumstances when the majority of Others are not species and when this Other majority meets without human recognition or involvement.

At the outset of her latest work, Haraway details the community of the human body:

> "I love the fact that human genomes can be found in only about 10 percent of all the cells that occupy the mundane space I call my body; the other 90 percent of the cells are filled with the genomes of bacteria, fungi, protists, and such, some of which play in a symphony necessary to my being alive at all, and some of which are hitching a ride and doing the rest of me, of us, no harm. I am vastly outnumbered by my tiny companions; better put, I become an adult human being in company with these tiny messmates. To be one is always to become with many" (page 3).

Haraway asks of these families of kin and (taxonomic) kind important questions about the possibilities for becoming-with companion species. Here, relating precedes identity. Not, as Haraway points out, that species do not have ontologies-in-themselves "sometimes-separate heritages both before and lateral to *this* encounter" (page 25). But there is contagion at work in Haraway's species-meeting: kin and kind defined less through "arboreal descent" and more through "the play of bodies" (page 30). Haraway's companion species impregnation is metaphoric to be sure in its weaving of histories of codependence and production, but it is more than this: a literal enmeshing of bodies and all of their resident companion species (and those species') in a recursive cascade that defines how we know what we know. "Turtling all the way down" as Haraway, and Isabelle Stengers (1997) put it.

This incalculable enmeshment proceeds from a different, non-human-centered ontology than Kant's sublime, Wittgenstein's lion, Lyotard's inhuman and differend, Heidegger's Hand-Werk, Levinas's dog Bobby, and ultimately Derrida's cat, each of whose epistemologies pivot on a comparison between humans and (the) animal that leads to the latter's ultimate disavowal. And while the main meetings that concern Haraway are those of dogs and humans (and all of their cascading technological, political economic, ecological, and ethical entanglements), she is clearly sympathetic to the fact that focusing on animals "big like us" (Margulis, 2007, personal communication) encourages a profoundly myopic humanism. In short, insofar as the philosophical limit remains the human-animal—and given that humans are animals—bacteria's 'faciality' remains obscured within the human imaginative horizon.

Microontologies concern companion species that are not species at all: companion with not-species as it were. Populating this 'unseen majority' are about 5×10^{30} bacterial cells on Earth: that's 5000 000 000 000 000 000 000 000 000 000 bacterial cells (Whitman et al, 1998). Another estimated 10^{18}—1000 000 000 000 000 000—bacteria circulate in the atmosphere attached to dust. Most organisms are bacteria: they evince the greatest organismal diversity, and have dominated evolutionary history. Bacteria invented all major forms of metabolism, multicellularity, nanotechnology, metallurgy, sensory and

locomotive apparatuses (such as the wheel), reproductive strategies and community organization, light detection, alcohol, gas and mineral conversion, hypersex, and death (Margulis, 1981). Bacteria are von Helmholtz's "less glamorous backstage machinery that actually produces the show" (Canadian Broadcasting Corporation Radio, 2007).

Bacteria sustain the chemical elements crucial to life on Earth—oxygen, nitrogen, phosphorous, sulfur, and carbon, and some twenty-five other gases—through ongoing (re)cycling processes that enable flora and fauna to thrive (Sagan and Margulis, 1993). Bacteria not only evolved all life (reproduction, photosynthesis, and movement) on Earth; they provided the environment in which different kinds of living organisms *can* exist (Smil, 2002). Bacteria also invented symbiogenesis, the process through which the cells that make up our human bodies were formed (Margulis, 1981). All eukaryotic cells are heterogenomic (their genomes have more than a single type of ancestor). Genetically and morphologically, eukaryotic cells are communities rather than individual entities.

Moreover, and as Haraway's earlier quote suggests, of all the cells in a human body, 10% are eukaryotic (derived from bacteria) and 90% are bacteria (Sapp, 2003, page 235). So, turtling all the way down means that we are, ancestrally, made up of bacteria. It also means that any given human/animal body is a symbiont: 600 species of bacteria in our mouths and 400 species of bacteria in our guts, and the countless more bacteria that inhabit our orifices and skin (Lingis, 2003). Indeed, the number of bacteria in our mouths is comparable to the total number of human beings that have ever lived on Earth (Margulis and Sagan, 2007). The number of microbes in our bodies exceeds the number of cells in our bodies by 100 fold. The human distal gut contains more than 100 times as many genes as our human genome (which has 2.85 billion base pairs). Every living thing that exists now, or has ever lived, is bacterial (Gould, 1996; Sterelny, 1999). Asking what bacteria have to do with humans is, in other words, asking the wrong question, or as Cary Wolfe puts it referring to humanism, "the 'human' that we know now, is not now, and never was, itself'' (2003, page xxiii).

This latter consideration means that meetings with the microcosmos must somehow recognize that these species-defying organisms do precede relating. These meetings must also somehow recognize that 'I' am bacteria and that our symbiotic and symbiogenic ancestry means that it is *symbionts all-the-way-down*. Microontologies further recognize that the vast majority of microbial intra-actions have nothing to do with humans. Humans do not even know about the vast majority of intra-actions that take place on Earth. Moreover, symbioses are obligate for animals but not bacteria. Putting this in larger evolutionary perspective,

> "if you wiped out all multicellur life forms off the face of the earth, microbial life might shift a tiny bit ... . If microbial life were to disappear, that would be it—instant death for the planet" (Woese in Blakeslee, 1996).

Our all-too-human insistent focus on biota 'big like us' obscures the rich diversity of living structures and processes through which the biota, including animals like us, thrive.

I am curious about what this microontology might mean for Other encounters. Jacques Derrida (1991) theorizes Other-ethics in terms of how to "eat well". Michael Pollan identifies eating as a site par excellence which entangles human/animal, species, technologies, living and nonliving, naturecultures:

> "the way we eat represents our most profound engagement with the natural world. Daily, our eating turns nature into culture, transforming the body of the world into our bodies and minds ... . Our eating also constitutes a relationship with dozens of other species—plants, animals, and fungi—with which we have co-evolved to the point where our fates are deeply entwined ... . It defines us" (2006, page 10).

We may think of eating in a literal sense: how organisms ingest, use, or otherwise transform living/nonliving matter. All animals are, by definition, consumers (heterotrophs must use ready-made organic compounds). Many bacteria, by contrast, do not 'eat' (they 'fix' or otherwise convert the elements on which all living organisms depend). As producers, these bacteria engage in a different economy of eating and relating with the world. This difference invokes a metaphoric sense of 'eating well'—an ethics through which "care, respect, and difference can flourish in the open" (Haraway, page 287) at the same time that humans face the "omnivores' dilemma" (Pollan, 2006). Human 'eating well' intimately depends upon bacterial encounters and entanglements: bacteria produce the food we eat; bacteria inhabit the food we eat; and if not for our bacterial gut companions, we could not digest what we eat. The beef empire would not exist without bacteria (Smil, 2002). As Derrida observes:

> "One never eats entirely on one's own: this constitutes the rule underlying the statement 'one must eat well.' It is a rule offering infinite hospitality. And in all differences, ruptures and wars (one might even say wars of religion), 'eating well' is at stake. Today more than ever. One must eat well—here is a maxim whose modalities and contents need only be varied, ad infinitum.... A discourse thus restructured can try to situate in another way the question of what a human subject, a morality, a politics, the rights of the human subject are, can be, and should be. Still to come, this task is indeed far ahead of us" (1991, page 109).

Reflecting upon what it means to 'eat well', the final chapter of *When Species Meet* is devoted to "parting bites that might nourish mortal companion species who cannot and must not assimilate one another but who must learn to eat well, or at least well enough that care, respect, and difference can flourish in the open" (page 287). Haraway asks

> "What do they [species] contribute to the flourishing of the land and its critters (naturalcultural in that sense)? That question does not invite a disengaged 'liberal' ethics or politics but requires examined lives that take risks to help the flourishing of some ways of getting on together and not others" (pages 288–289, original emphasis).

Microontologies partake of further parting bites: who do we invite and who do we overlook when we meet the other in ethical encounters? How might human/animal/bacteria meet-with in the context of the current environmental crisis affecting animals? How does our current concern with human–animal relations obscure bacterial intra-actions that have nothing to do with humans, and are beyond human recognition? Eating well with bacteria, for instance, complicates animal rights discourse, vegetarianism and veganism. This task is indeed far ahead of us: we must somehow survive humanism, if we are to survive at all.

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