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Configurations, Volume 20, Number 3, Fall 2012, pp. 213-237 (Article)

Published by The Johns Hopkins University Press
DOI: 10.1353/con.2012.0019

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Accessed 2 Jul 2013 08:26 GMT GMT

Digesting Difference: Metabolism and the Question of Sexual Difference

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ABSTRACT: Elizabeth Grosz's research program offers a thoughtful and complex argument for sexual difference as ontology. Gathering together Grosz's considerable writing, which she synthesizes in her most recent book, *Becoming Undone*, this essay explores Grosz's engagement of sexual difference through evolutionary theory. This refraction invites challenging questions with which feminist theory might think through one of its defining issues. A close reading of Grosz's work reveals contradictions, tensions, and problems in discussions of being versus becoming; duration versus the stasis of sexual difference; and neo-Darwinian humanism versus Darwinian inhumanism, and the former's consequent normalizing of sexual difference. The essay concludes with a discussion of metabolism as sexual difference's potential foil. Refracting metabolism – as a force – through evolutionary theory excites the significant contradictions that sexual difference as ontology sustains in Grosz's analysis.

Introduction

"Nature," argues Elizabeth Grosz, "has been regarded primarily as a kind of obstacle against which we [feminists] need to struggle."[1] Grosz's extensive research is a timely provocation to consider the unresolved question of sexual difference. Her turn to evolutionary theory in the early 1990s as an analytic tool marked a significant departure from many feminist analyses and reflects her willingness to

1. Elizabeth Grosz, "Darwin and Feminism: Preliminary Investigations for a Possible Alliance," *Australian Feminist Studies* 14:29 (1999): 31–45, quote on p. 31.

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seek alternate (and, in this case, hitherto unpopular) analytics and to demonstrate their efficacy in advancing feminist theory.

Within feminist theory, liberal feminism has been widely criticized for its aspiration to equality based on sexual equivalence. As Luce Irigaray thoroughly argues, an ontology of equivalence burdens woman with the endless task of measuring-up to man as One.[2] Irigaray, Grosz, and others argue that an ontology of equivalence circumscribes the discussion to resource access and rights issues. Similarly, the affirmation of sexual or social identity through the concept of diversity reiterates the same problem insofar as it circumscribes politics to a comparative analysis of affective and behavioral characteristics. For this reason, Grosz turns to *difference*, which elides the "central organizing principle of identity—not a difference between living things, a comparison, but a difference which differentiates itself without having clear-cut or separable terms."[3]

With Irigaray, Grosz argues for an ontology of sexual difference. Women and men cannot be compared, she argues, because they are ontologically separate beings: biologically separated through evolutionary time with no possibility (if it were desirable) to return to some original point of sameness. "Instead of something distinguished from something else," as equivalence and diversity concepts propose, argues Grosz, "imagine something which distinguishes itself—and yet that from which it distinguishes itself does not distinguish from it."[4]

In an apposite move, Grosz turns to evolutionary theory to develop her theory of sexual difference. From the outset, she differentiates her interest in evolutionary theory from that of neo-Darwinism and its popularized renderings in sociobiology and evolutionary psychology. Neo-Darwinism offers a particular refracted account of Darwin's theory of evolution that reiterates modern hegemonic readings of sex and race. Alternate refractions, Grosz suggests, offer analytic possibilities for feminist matters of concern, including relations of sexual and racial difference, oppression, and social change.[5]

2. Luce Irigaray, *This Sex Which Is Not One* (Ithaca, NY: Cornell University Press, 2010), *Speculum of the Other Woman* (Ithaca, NY: Cornell University Press, 2010), and *Ethics of Sexual Difference* (Ithaca, NY: Cornell University Press, 2010).

3. Elizabeth Grosz, *Becoming Undone: Darwinian Reflections on Life, Politics, and Art* (Durham, NC: Duke University Press, 2012), p. 17.

4. Ibid., p. 93.

5. For a discussion of refraction, see Donna J. Haraway, "The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others," in *Cultural Studies,* ed. Lawrence Grossberg, Cary Nelson, and Paula A. Treichler (New York: Taylor & Francis, 1992), pp. 295–337.

Grosz's thesis involves a detailed dissection of Darwin's writings, and it gains traction through the work of philosophers who explicitly engaged with Darwin's theory. Her mobilization of Bergson's *duration*, Nietzsche's *will to power*, Deleuze's *virtual*, and Derrida's *violence* is strategic: each associates with evolution abundant variation, proliferation of life forms, and radical, open-ended futurity.[6] Time, vitalism as life force, chance, super-abundance—all become allies in Grosz's deployment of evolutionary theory within feminist and postcolonial politics.

Grosz's thoughtful exegesis, articulated most generously in *Becoming Undone: Darwinian Reflections on Life, Politics, and Art*, buttresses contemporary philosophical arguments in support of an ontology of sexual difference, most notably those advanced by Irigaray.[7] For both Grosz and Irigaray, sexual difference as ontology does much work, generating such phenomena as race and art as effects. *Becoming Undone* calls for a turn away from epistemology and what Grosz refers to as the politics of representation.[8] Feminist theory, she contends, privileges the epistemological (discourse) over the ontological (real), arguing that ontology precipitates questions about being and becoming "in the context of both animal becomings and the becomings [that are] microscopic and imperceptible that regulate matter itself."[9]

I am sympathetic to critiques of liberal feminism, and with Grosz, I contend that there is much for feminist theory to contemplate within Darwinian evolutionary theory with regard to the origins of sex and reproduction, and the place of such complex phenomena within deep time.[10] I do not, however, move from an eschewal of equivalence to sexual difference as ontology. Instead, I suggest that engaging different refractions of evolutionary theory may lead to yet other openings for feminist theory. Central to my analysis is a move away from an ontology based on an understanding of natural selection as both generative of difference that, once generated, maintains

6. Henri Bergson, *Matter and Memory* (New York: Zone Books, 1990) and *Creative Evolution* (Mineola, NY: Dover Publications, 1998); Friedrich Nietzsche, *The Will to Power* (New York: Vintage Books, 1968) and *The Gay Science* (New York: Vintage Books, 1974); Gilles Deleuze, *Difference and Repetition* (New York: Columbia University Press, 1994); Jacques Derrida, *The Gift of Death* (Chicago: University of Chicago Press, 1995).

7. Grosz, *Becoming Undone* (above, n. 3).

8. Ibid., p. 85.

9. Ibid., p. 86.

10. See Myra J. Hird, *The Origins of Sociable Life: Evolution after Science Studies* (Basingstoke, UK: Palgrave Macmillan, 2009).

stasis (of form, organization, ontogeny, and so on) and describes the dominant way in which difference is generated (generates itself). My analysis moves toward an ontology that is characteristic of deep time and "exorbitant globality," an ontology of inexhaustible flux resonant with a philosophy of becoming.[11]

Becoming, emergence, affiliation, difference, contagion—all are matters of entanglement, echoes of Darwin's "entangled bank," rather than arboreal descent through which what once was sameness diverges into eternal and irreconcilable difference.[12] Entanglement, as Karen Barad argues, is our greatest philosophical challenge, as it equally undermines sameness, equivalence, and difference within a nonlinear conception of time.[13]

To work my way through the complex questions that an ontology of sexual difference invites, I introduce metabolism as sexual difference's foil. Metabolism, including intake, digestion, and transport, is a primary and defining feature of life and an activity that all life forms, from cells to whole organisms, must engage in to maintain themselves. Metabolism, I will argue, may even be deployed to collapse the life/nonlife bifurcation. Given its immanence to the origins of life on earth and its centrality to *all* life, we might propose metabolism as ontology—an "ontology of metabolic difference" if you will. In other words, perhaps a substitution is in order: namely, metabolism for sexual difference. Instead, I want to think through the advantages of understanding metabolism as an evolutionary force; that is, metabolizing as a force of evolution and an inorganic activity through which cells, organisms, life, and nonlife maintains, develops, and responds. Metabolism messes with arboreal evolutionary lineage; it favors contagic duration, refracting the question of difference in deep time.

Grosz and Evolutionary Theory

Around the same time that feminist theory was taking its contemporary social-constructionist turn, theorizing bodily materiality as a discursive effect, and arguing that gender produced sex, Grosz's work engaged with sex and materiality through a sustained dialogue

11. For a discussion of "exorbitant globality," see Nigel Clark, "Ex-orbitant Globality," *Theory, Culture & Society* 22:5 (2005): 165–185.

12. Charles Darwin, *The Origin of Species* (Ware, UK: Worsdworth Editions Ltd, 1998), p. 268.

13. Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, NC: Duke University Press, 2008).

with evolutionary theory.[14] Engaging with Darwin meant theorizing materiality as neither discursive production nor biological reduction; it also meant developing a theory unburdened by an underlying human exceptionalism. "I attempt to develop," Grosz explains, "a concept of life that does not privilege the human as the aim or end of evolution, but sees the human as one among many species," including "protozoa, bacteria and viruses."[15] As such, Grosz and others call attention to the fundamental *indifference* of evolution to the human.[16] This shift away from humanism is important because it requires vigilance in recognizing what we consider to be nature's *normal* state of affairs. For instance, an inhuman perspective recognizes nonsexual forms of reproduction as majority practice. Analyzing sexual difference from an inhuman perspective is a key point I return to later in this essay.

To elaborate her theory of sexual difference, Grosz first differentiates life from matter. Reading matter and life through Bergon's philosophy, she argues that they are "different degrees of one and the same force."[17] This force is the "impetus to vary itself, to capitalize on its material conditions, to differ."[18] The force of life and matter, then, is differentiating. More specifically, Grosz explains that "life is matter extended into the virtual; matter is life compressed into dormancy."[19] According to her, through the will to power, Nietzsche conceives of evolution as a process involving the abundance of energy, force, and production—all sourced within the individual (cells, tissues, organs) rather than the environment. In this sense, Grosz argues, Darwin's emphasis on persistent variation coincides with Nietzsche's theory of time as the "open-ended becoming of the past

14. Sex as discursive effect was most popularly argued in Judith Butler, *Gender Trouble: Feminism and the Subversion of Identity* (New York: Routledge, 1990). See Vicki Kirby's *Judith Butler: Live Theory* (New York: Continuum, 2006) for a thorough critique of Butler's work; see also Elizabeth Grosz's *Volatile Bodies: Toward a Corporeal Feminism* (Bloomington: Indiana University Press, 1994) for Grosz's dialogue with social constructionism. Her later works include *The Nick of Time: Politics, Evolution, and the Untimely* (Durham, NC: Duke University Press, 2004) and *Time Travels: Feminism, Nature, Power* (Durham, NC: Duke University Press, 2005).

15. Grosz, *Becoming Undone* (above, n. 3), pp. 2, 13.

16. See also Myra J. Hird, "Indifferent Globality," *Theory, Culture & Society* 27:2–3 (2010): 54–72.

17. Grosz, *Becoming Undone* (above, n. 3), p. 32.

18. Ibid., p. 33.

19. Ibid., p. 32.

into an unknowable future."[20] Grosz also refers to matter as "chaos," which seems to resonate with familiar theological themes in which life somehow structures or orders matter's inherent disorder. As we shall see, it is important to Grosz's ontology that matter, extended into the virtual, eventually actualizes discontinuous structure.

"Insofar ", writes Grosz, "as the living carry the past along with the present," there is no real repetition, since everything differs in every iteration or repetition. Life, for Grosz, "extended into the virtual" is duration.[21] Since all life embodies each difference, a linear sense of time is inadequate. As the famous Heraclitus saying goes, we never step into the same river twice because both the river and ourselves change. Bergson's concept of duration as that which splits the actual and virtual means that "the living being essentially has duration; it has duration precisely because it is continuously elaborating what is new and because there is no elaboration without searching, no searching without groping."[22] Bergson's concept of duration attempts to encapsulate those aspects of life (sensations, affects) that do not lend themselves to quantification, but to "continual elaboration" involving the past's presence in the present and future as becoming.[23] The possible, according to Grosz's reading of Bergson and Deleuze, has a reality without being actual, while the actual is produced through differentiation from the virtual, involving the creation of "the varieties that constitute creative evolution."[24] Evolution, by this reading, is the continuity and discontinuity of duration: "what endures . . . is not what remains unchanging or the same over time . . . but what diverges and transforms itself with the passage of time."[25] Evolution, then, is creative insofar as it does not unfold an a priori blueprint, no more than it reveals only the successive accumulation of minute changes over time.[26] *The Nick of Time: Politics, Evolution, and the Untimely* offers further amplifications. The "nick" refers to the shift—or, to use Prigogine and Stengers's terminology, "phase transition"—produced by events that signal the unpredictability of the present from the past (and future from the

20. Grosz, *The Nick of Time* (above, n. 14), p. 114.

21. Grosz, *Becoming Undone* (above, n. 3), p. 92.

22. Henri Bergson, qtd. in Grosz, *Time Travels* (above, n. 14), p. 106.

23. Grosz, *The Nick of Time* (above, n. 14), p. 161.

24. Grosz, *Time Travels* (above, n. 14), p. 109.

25. Ibid., p. 110.

26. Bergson, *Creative Evolution* (above, n. 6).

present).[27] Using Deleuze's work, Grosz understands evolution as a relentless play between repetition (continuity through forms of reproduction—a conceptualization that I reflect upon later) and difference (the diverse, chance mutations arising through endless repetition), thus creating "systems of differentiation" through natural selection.[28] Explicitly anti-teleological, Grosz argues that, "evolution is a fundamentally open-ended system which pushes towards a future with no real direction, no promise of any particular result, no guarantee of progress or improvement, but with every indication of inherent proliferation and transformation."[29] Nature, via evolution, is always on the move.

Grosz's early work illuminates nature as excessive to the conservative Malthusian formulations interpreted by Herbert Spencer and others as "survival of the fittest." Nature, for Darwin, tends toward "superabundance," "excessiveness," and "a vast but often minute series of individual variations."[30] For instance, describing Caillois's work, Grosz notes that "the particular characteristics defining an insect species . . . are always in excess of their survival value. There is a certain structural, anatomical or behavioral superabundance."[31] Thus Grosz convincingly harnesses Bergson's, Nietzsche's, and Darwin's own writings to argue for evolution as complex, changing and changeable, productive, and nonlinear:

> He [Darwin] transformed the concept of life . . . from a static quality into a dynamic process. In his writings, being is transformed into becoming, essence into existence, and the past and the present are rendered provisional in light of the force of the future. Life is construed as a confrontation with the accidental as well as the expected, a consequence of the random as well as the predictable. It is the response, the very openness, of material organization to the dynamism of time. In short, life is now understood, perhaps for the first time in the sciences, as fundamental becoming, becoming in every detail. *Descent, the continuity of life through time, is not the transmission of invariable or clearly defined characteristics over regular, measurable periods of time (as various essentialisms imply), but the generation of endless variation, endless openness to the accidental, the random, the unexpected.* He thus makes temporality an irreducible element of the encounter between individual variation and natural selection,

27. Ilya Prigogine and Isabelle Stengers, *Order Out of Chaos: Man's New Dialogue with Nature* (Toronto: Bantam Books, 1984).

28. Grosz, *Time Travels* (above, n. 14), p. 27.

29. Ibid., p. 39.

30. Grosz, "Darwin and Feminism" (above, n. 1), p. 35.

31. Grosz, *Time Travels* (above, n. 14), p. 280.

> the two principles that, in interaction, produce all of life's organic and cultural achievements.[32]

But Grosz's project is also directed toward arguing for an ontology of sexual difference: an inalienable, universal, and irreversible difference that generates and permanently marks humans, as well as the majority of life on earth. She does this by reading Darwin's theory of evolution through Irigaray's philosophical arguments concerning sexual difference: "if Irigaray sees sexual difference as the engine of cultural life," writes Grosz, "Darwin sees it as the motor of natural existence."[33] To build her argument, Grosz returns to the concept of difference. "Life," she argues in her most recent book, "is an extension and elaboration of matter through *attenuating* divergence or difference."[34] Life, in other words, *diminishes* the difference found in matter. On the one hand, then, life extends matter into the virtual through the opening up of the possibilities of form, development, and so on, but life also diminishes or reduces these possibilities through order, structure, and difference. There is a tension, or balance perhaps, between the virtual and determinate form that may only be read retrospectively through linear time—a tension, that is, between becoming and being. Grosz's concept of becoming folds Bergson's duration into Deleuze and Guattari's theory of difference. Resonating with her discussion of matter and life, Grosz defines difference as that which, as mentioned earlier, differentiates itself from the undifferentiated. According to Grosz, difference, in this sense, is determination—it "makes possible distinctness, things, oppositions."[35]

Grosz's ontology of sexual difference now unfolds in a series of assertions. First, sexual difference reveals a (linear) *history*—past, present, and future—of evolution. Acknowledging Darwin's likely rejection of sexual difference as irreducible because evolutionary theory is based on the natural selection of continuous and proliferating variations through deep time, Grosz nevertheless asserts that once sexual difference "erupts as a random invention of life, [it] comes to characterize *most of life* in increasingly marked terms."[36] Among "primitive" bacterial and other microbial life, "asexual reproduction" meant no difference: "without sexual difference there

32. Grosz, *The Nick of Time* (above, n. 14), p. 7 (emphasis added).

33. Grosz, *Becoming Undone* (above, n. 3), p. 143.

34. Ibid., p. 30.

35. Ibid., p. 93.

36. Ibid., p. 166 (emphasis added).

may be life, life of the bacterial kind, life that reproduces itself as the same except for contingency or random accident, except for transcription errors at the genetic level, but there can be no newness, no inherent direction to the future and the unknown."[37] Emphasizing her assertion that only sexual difference generates difference, Grosz writes that "[w]ithout sexual difference there could be no life as we know it, no living bodies, no terrestrial movement, no differentiation of species, no differentiation of humans from each other into races and classes—only sameness, monosexuality, hermaphroditism, the endless structured (bacterial or microbial) reproduction of the same."[38]

Sexual difference erupts into life as a "bifurcation [that can] never be restored to unity." There is a cut or nick in time here from no sex to two, with no possible return or further differentiation from two. Out of this past, humans and most life on earth come in two irreducible forms: "There is an irreducible difference between the sexes, and this difference is *not only* irreducible to one of its terms, in the case of sociobiology, its reproductive cells; it is also irreducible to any other level, whether cellular, morphological, cultural or historical."[39] These "two forms," Grosz argues, "divide most of life into divergent categories."[40] Elsewhere, she reiterates that life is "never to be reconciled in a single entity again."[41]

It is important to Grosz's argument that Darwin separates natural selection from sexual selection. The former, argues Grosz, is directed toward survival, whereas the latter directs the realization of sexual partners and sometimes then to the reproduction of offspring. As such, she identifies sexual selection as the "second principle of life on earth"—and further, the more powerful force.[42] And it is sexual selection, rather than natural selection, that "provides the energy, impetus, and interest in the production of excessive qualities, qualities over and above those that accomplish mere survival of the individual."[43]

In earlier work, Grosz argues that race is socially constructed, writing that the origin of race "is a consequence of human, or rather,

37. Ibid., pp. 101, 163, 164, 168.

38. Ibid., p. 101.

39. Grosz, *The Nick of Time* (above, n. 14), p. 67 (emphasis added).

40. Ibid.

41. Ibid., p. 166.

42. Ibid., p. 123.

43. Ibid., p. 132.

scientific taxonomy, a function of language."[44] However, in her most recent book, *Becoming Undone*, race is now a material effect, not unlike Butler's thesis that gender creates sex as effect; for both Butler and Grosz, sex and race are materially real as effects. The difference is that Grosz also argues that the producer—namely, sexual difference—is also real. Grosz argues that sexual difference materially *creates* race through differential desire translated into generational inheritance of particular phenotypic characteristics. In other words, she argues that sexual difference produces two separate sexes, each desiring particular characteristics, which, over many generations, produces (supposedly) distinct racial phenotypic characteristics. Grosz makes the same argument with regard to art, which she views as another productive effect of sexual difference.

In short, sexual difference cannot be reduced, or vary, from itself. It exists all the way down in all strata—cellular, morphological, cultural, physiological, historical. Sexual difference, then, is a grand theory insofar as it is: "universal," "inevitable," and "ineliminable"; "*cannot* be overcome," "*cannot* be superseded"; is the "natural and social condition . . . not only of subjects but of the human in general and of a living and dynamic nature in its totality"; the "engine of life"; and "the condition of all other living differences."[45] Sexual difference is nothing short of life itself: "air and sexual difference may be the two dimensions vital for/to life."[46]

Grosz's writing is complex, nuanced, and productive; her ambition to harness evolutionary theory with a philosophy of sexual difference provides rich analytic sites. Grosz's project to devise an ontology of sexual difference—an ontology that must provide the explanatory power of grand theory—creates contradictions that are important to think through as questions for feminist theory. These contradictions reveal themselves in discussions of being versus becoming; duration versus the fixity of sexual difference; Darwinian evolutionary theory's emphasis on species' adaptation to their unique and changing environments versus neo-Darwinian theory's hierarchy of species; and an inhumanist understanding of sex and reproduction versus a humanist conception of the salience of heterosexual reproduction to life as we know it. These contradictions form the basis of my engagement with Grosz's theory in the remainder of this essay.

44. Ibid., p. 23.

45. Ibid., pp. 102–103, 146 (emphasis added).

46. Ibid., p. 105.

Sex, Reproduction, and Becoming in Deep Time

Let us pause here to distill what contradictions arise when evolutionary theory is refracted through an ontology of sexual difference. The first contradiction, or tension, is between humanist and inhumanist interpretations of life and matter. Within neo-Darwinism's inherent humanist approach, organisms are organized in a hierarchy from least complex or primitive (Archaea and Bacteria), to more complex (for instance, multicellular), and upward to most complex, typically including plants and (human) animals. The differentiation of lower from higher organisms runs counter to Darwin's inhumanist theory of evolution. Each organism, Darwin reminded us, is well-adapted to its particular changing environment, and identifying characteristics that are deemed better or more complex—for example, language, flight, tool use, hyper-sex, metamorphosis—misconstrues this defining feature of Darwinian evolution.[47] It is indeed, to reflect back on Grosz's criticism of liberal feminism, to begin from an ontology of equivalence. In this case, comparisons are made to the human One. Throughout *Becoming Undone*, Grosz refers to bacteria as primitive and invokes the neo-Darwinist hierarchy, "from the bacterial level *upward*."[48] Her hierarchization of life reiterates the very humanist approach she explicitly seeks to challenge: "I attempt to develop," she writes, "a concept of life that does not privilege the human as the aim of evolution, but sees the human as one among many species, [including] protozoa, bacteria and viruses."[49]

But a humanist standpoint is important if the goal is to *normatize* sexual difference. Claire Colebrook diagnoses this theorization of life as elaborating a humanist approach with normatizing consequences: "theory has retreated from a position of theory (or inhuman disengagement) to a traditional figure of the sexual binary. In all cases what is rehearsed is a theological-anthropomorphic insistence on the fruitful, productive, relatively closed sexually dynamic couple, set over and against a (supposedly a-political) circulation

47. This defining feature was long in the making and continues today in neo-Darwinism. As Rebecca Stott observes, humanism "was a habit of thought almost impossible to resist because it dominated the ideas of most of the philosophical naturalists, however radical. There were higher animals and lower animals and the job of the lower animals was to serve the higher animals as food or as fuel, or even as ocean lights: each to his place and purpose." See Stott, *Darwin and the Barnacle: The Story of One Tiny Creature and History's Most Spectacular Scientific Breakthrough* (New York: W. W. Norton, 2003), p. 59.

48. Grosz, *Becoming Undone* (above, n. 3), pp. 163, 105 (emphasis added).

49. Ibid., pp. 2, 13.

of difference, exchange and possibly unproductive and senseless proliferation."[50]

A second related contradiction develops in the characterization of what Vicki Kirby refers to as "primordial segregation"—that is, a humanist normatizing separation of sexual difference.[51] Sexual difference, writes Grosz, "divide[s] most of life into divergent categories." Except that it doesn't. Most life on earth is not animal (or plant for that matter); most organisms are not differentiated by sexual difference. All the different kinds of bacteria on earth are estimated to number 5 million-trillion-trillion (5×10^{30}). There are also an estimated 1.5 million species of fungi, many of these reproducing nonsexually through budding, fission, fragmentation, and sporulation. So, most organisms do not reproduce through sexual reproduction. A humanist perspective precipitates a second contradiction or problem, then, which is to assume both the connection between sexual difference and sexual reproduction, and the saliency of the latter among life forms and in evolution. From a humanist perspective, sex and reproduction occur together, despite the fact that cells within human bodies exchange genes and reproduce themselves without sexually reproducing. "We" (animals) are constantly exchanging genes and nonsexually reproducing. From an inhumanist perspective, sex and reproduction are not synonymous.[52] Sex is "any process that recombines genes (DNA) in an individual cell or organism from more than a single source. . . . [It] may occur at the nucleic acid, nuclear, cytoplasmic, and other levels."[53] Sex may occur through cosmic irradiation, virus and symbiont acquisition, or exposure to ambient chemicals.

Reproduction, by contrast, is the process that augments the number of cells or organisms. Molecules, cells, organisms, and communities reproduce. Sexual reproduction is a minority practice among species on earth, in which DNA exchange and an increase in the number of organisms occurs together. Not surprisingly, neo-Darwinism defines sexual reproduction as *the* central problem facing

50. Claire Colebrook, "Sexual Indifference," in *Telemorphosis: Theory in the Era of Climate Change*, vol. 1, ed. Tom Cohen (Ann Arbor, MI: Open Humanities Press, 2012), pp. 167–182, quote on p. 173.

51. Vicki Kirby, *Quantum Anthropologies: Life at Large*. (Durham, NC: Duke University Press, 2011), p. 130.

52. A more extensive outline of this thesis occurs in Hird, *The Origins of Sociable Life* (above, n. 10).

53. Lynn Margulis and Dorion Sagan, *Origins of Sex: Three Billion Years of Genetic Recombination* (New Haven, CT: Yale University Press, 1986), p. 235.

evolutionary theory. Why, according to theorists like Richard Dawkins, would organisms reproduce sexually when it appears that organisms that are not confined to sexual reproduction are able to exchange DNA and make offspring more quickly and at less cost? Neo-Darwinism offers explanations, such as a greater genetic novelty through the recombination of two heritable genomes and a greater ability to evade parasites, eliminate deleterious mutations, and promote adaptations to new environments. These factors all increase organisms' "per locus heterozygosity," which means that the greater *genetic* variation of any given allele, the better its chances of withstanding environmental change.[54]

But asking why, as neo-Darwinism does, some organisms sexually reproduce is asking the wrong question. For evolutionary theorist Lynn Margulis, sexual reproduction evolved through three contingent circumstances of environment-organism response.[55] The first was DNA repair. DNA derived from multiple sources became possible and advantageous when bacteria exchanged their DNA. Thus "in evolutionary terms, the appearance of excision-enzyme mechanisms to repair damaged DNA is a pre-adaptation to bacterial sex in which an entirely different DNA molecule is used for the source of the information to repair the damage."[56] The second and third factors—multicellularity and differentiation—are the outcomes of serial endosymbiotic mergings in response to environmental pressures. According to Margulis, mitosis emerged when some protists failed to metabolize other protists they had eaten. This failed digestion mixed up their genetic material through hyper-sex. This doubled form would have been advantageous because its smaller surface area per volume would have better tolerated desiccation and/or starvation. Thus the duplication of chromatin before mitosis was originally a merger that eventually produced a new type of organism

54. See William D. Hamilton, Robert Axelrod, and Reiko Tanese, "Sexual Reproduction as an Adaptation to Resist Parasites," *Proceedings of the National Academy of Sciences* 87:9 (1990): 3566–3573; Aneil F. Agrawal, "Similarity Selection and the Evolution of Sex: Revisiting the Red Queen," *PLOS Biology* 4 (2006): 1364–1371; Alexey Kondrashov, "Deleterious Mutations and the Evolution of Sexual Reproduction," *Nature* 336 (1988): 435–440; R. A. Fisher, *The Genetical Theory of Natural Selection* (Oxford: Clarendon Press, 1930); and Joseph Felsenstein, "The Evolutionary Advantage of Recombination," *Genetics* 78:2 (1974): 737–756.

55. Lynn Margulis, *Symbiosis in Cell Evolution* (San Francisco: W. H. Freeman, 1981); Margulis and Sagan, *Origins of Sex* (above, n. 53); Lynn Margulis and Dorion Sagan, *What Is Sex?* (New York: Simon & Schuster 1997).

56. Margulis and Sagan, *Origins of Sex* (above, n. 53), p. 58.

through *symbiogenesis*.[57] It would have also doubled the number of chromosomes without fertilization. Sex was not an adaptation; rather, it was advantageous to be smaller and to be better able to move around because of the decreased need for water. As Root Gorelick summarizes, "what started as a meal, wound up being the origin of sex."[58]

Retaining and exchanging the motile systems of their symbionts came at a price for animals: they could no longer divide by mitosis (the undulipodia of animal cells differentiate, but do not further divide). In order to retain undulipodiated motility *and* genetic recombination, these symbionts reproduced by meiosis. In this serial endosymbiosis account, sexual reproduction evolved by accident as a byproduct of the evolution of multicellularity and cellular differentiation: "mixis . . . becomes a consequence of the need to preserve differentiation . . . mixis itself is dispensable and . . . was never selected for directly."[59] Put another way, "multicellularity provided evolutionary advantages and sex came along for the ride."[60] Sexual recombination was only one of the methods adapted. As Kim Sterelny and Paul Griffiths write, "obligatory sexual reproduction and invariable uniparental reproduction are two ends of a continuum, not discrete alternatives into which all organisms can be unambiguously sorted."[61] Humans sometimes practice *mixis*, then, because of a series of evolutionary "give and takes" and "failures"—or what U. P. Roos calls a "tortuous path."[62]

Thus sexual reproduction is not better than the myriad nonsexual forms of either exchanging genes or adding to the number of organ-

57. *Symbiogenesis* is the appearance of a new phenotype, trait, tissue, organelle, organ, or organism from a symbiotic relationship; see Margulis, *Symbiosis in Cell Evolution* (above, n. 55).

58. Root Gorelick, "Origin of Sex: The Evolutionary Joys of Self Sex" (unpublished manuscript, 2009).

59. *Mixis* refers to a particular form of sexual reproduction, one practiced by some humans for short periods of time that produces one or more human infant(s); it includes the fertilization of sperm and ovum and related processes that result in alternating diploid and haploid phases.

60. Anne Fausto-Sterling, "Feminism and Behavioral Evolution: A Taxonomy," in *Feminism and Evolutionary Biology: Boundaries, Intersections, and Frontiers*, ed. Patricia Adair Gowaty (New York: Chapman & Hall, 1997), pp. 42–60, quote on p. 53.

61. Kim Sterelny and Paul E. Griffiths, *Sex and Death: An Introduction to Philosophy of Biology* (Chicago: University of Chicago Press, 1999), p. 71.

62. U. P. Roos, "From Proto-Mitosis to Mitosis—an Alternative Hypothesis on the Origin and Evolution of the Mitotic Spindle," *Origins of Life and Evolution of Biospheres*, 13:3–4 (1984): 183–193, quote on p. 183.

isms in a kind or species. Sexual reproduction itself, in other words, is not an adaptation. Other things were, and sexual reproduction for a minority of living organisms was an effect. For now, and only if we take any organism as a self-contained, bounded, autonomous individual that both descended in arboreal-type evolution and does not exchange, affiliate, respond to, or infect any other entities in its durational becoming. All this also severely undermines the heterosexism implicitly embedded in Grosz's notion that true creativity can only come from heterosexual reproduction, and it adds fodder to queer theory's challenge to sexual difference as ontology.[63]

A third contradiction in Grosz's theory is that sexual difference as ontology relies upon a gene-centric neo-Darwinian account of evolution. What supposedly marks "asexual reproduction"—a rhetorical term that Grosz borrows from neo-Darwinism to reiterate the assumption that nonsexual forms of reproduction deviate from the supposed norm of sexual reproduction—is the failure to generate genetic difference between generations—or, to put it in another way, the inability to generate difference: "Without sexual difference there may be life, life of the bacterial kind, life that reproduces itself as the same except for contingency or random accident, except for *transcription errors at the genetic level*, but there can be no newness, no inherent direction to the future and the unknown."[64] Sexual difference, writes Grosz, "erupts massive variation and difference into the world of the living; it is a difference machine that ensures all progeny *vary from their parents*, and that all individuals differ from each other (*with the exception of identical twins*)."[65] Identical twins can only be the exception when genes are the focus and when ontogeny is ignored. As much as Grosz's work seeks a nongene-centric ontology of sexual difference, genetic variation becomes the defining characteristic in the generation of novelty, newness, and creativity. But this is only genetic variation that occurs at conception; genetic changes that occur during development do not count here.

A fourth contradiction that an ontology of sexual difference creates concerns the assumption that organisms are bounded and at least semi-autonomous individuals. Referring to the history of zoology during Darwin's era, Rebecca Stott writes that "[l]ife was in a state of complex entanglement, yet the practice of so many zoologists was to separate organisms from their environment and from

63. I thank one of the anonymous reviewers for pointing out this link with queer theory. I copied a portion of the reviewer's comment verbatim.

64. Grosz, *Becoming Undone* (above, n. 3), pp. 128, 101 (emphasis added).

65. Ibid., p. 133.

the other organisms with which they were entangled and to box and pin them in splendid isolation."[66] Deep-time evolution points to the autonomous individual as a fiction.[67] "We" were never autonomous entities. Life's beginning was a material entanglement. Barad's use of the term "*in*human" wonderfully points to the fact that any so-called organism is itself a complex assemblage of countless entities. About 90 percent of the entities—themselves assemblages—that make up what we call "human being" are bacterial.

Furthermore, from a deep-time perspective, nonsexually reproducing organisms like bacteria have infected, affiliated, formed and entangled webs, and produce much more novelty than all other kinds of organisms put together. Bacteria, in other words, have engendered newness, difference, and creativity like no others. Clearly, evolution does not require sexual difference as a prerequisite for newness, novelty, or generation. In deep-time, life's most vital and prolific novelty occurred in the Precambrian era, when bacteria generated multicellularity, motility, all forms of metabolism, nanotechnology, light detection, gas and mineral conversion, hyper-sex, death, recycling, metallurgy, and sensory apparatuses. This is surely an impressive dossier of generativity—an eruption of massive variation and difference. Add to this the variation of bacterial kinds—variation generated without sexual reproduction—and the wide varieties of ways that bacteria reproduce that generate novelty.[68] As Donna Haraway wryly remarks, "'reproduction'—or less inaccurately, the generation of novel forms—need not be imagined in the stodgy bipolar terms of hominids."[69]

Grosz herself introduces symbiosis as an articulation of becoming: "if evolution includes any veritable becomings, it is in the domain of symbiosis that brings into play beings of totally different scales and kingdoms, with no possible filiation."[70] Notwithstanding

66. Stott, *Darwin and the Barnacle* (above, n. 47), p. 60. See also Elizabeth A. Wilson, "Biologically Inspired Feminism: Response to Helen Keane and Marsha Rosengarten, 'On the Biology of Sexed Subjects,'" *Australian Feminist Studies* 17:39 (2002): 283–285.

67. Myra J. Hird, "Meeting with the Microcosmos," *Environment and Planning D: Society and Space* 28 (2010): 36–39; Hird, "Symbiosis, Microbes, Coevolution and Sociology," *Ecological Economics* 69:4 (2010): 737–742; Hird, "The Corporeal Generosity of Maternity," *Body and Society* 13:1 (2007): 1–20; Hird, "Chimerism, Mosaicism and the Cultural Construction of Kinship," *Sexualities* 7:2 (2004): 225–240.

68. Bacteria are not species because of their ability to exchange genes and reproduce with different kinds of bacteria.

69. Haraway, "The Promise of Monsters" (above, n. 5), p. 299.

70. Grosz, *Becoming Undone* (above n. 3), p. 53.

that deep evolutionary time occludes any strong notion of scales, species, or kingdoms (everything is always already filiated through contagic duration), symbiosis presents a strong challenge to the hegemony of natural selection through random mutation promulgated within neo-Darwinism. Bacteria engage in cascading relations of symbioses—mutually sustaining, pathogenic, obligate, or otherwise—with other organisms, including other bacteria. Symbiogenesis, not sexual difference, led to eukaryotes such as animals that are able to use chemical energy thanks to the once free-living bacteria that merged with other kinds of bacteria to become the mitochondria that generate adadenosine triphosphate (ATP). Plants photosynthesize thanks to the symbiogenetic merger of once free-living chloroplasts with other bacteria. And it may be that eukaryotic cells also resulted from a bacterial merger of wall-less archaebacteria and eubacteria to produce a cell that contains a karyomastigont, whose motile apparatuses (tails) were once free-living spirochetes. Symbiogenesis compromises any discussion of the autonomy of any living organism and thus any discussion of one, two, or any defined particular number of sexes.[71] The history of sexual difference involves deep time, our bacterial ancestors, and contemporary companions—those messmates that make up the majority of life on earth.[72] Whatever *we* are, it is certainly multiple and contagic.

This raises another issue: namely, the assumption of homogeneity within a given sex. Sexual difference as ontology assumes that the difference in kind between women and men is greater than the difference among women or men. But difference, in a Deleuzian sense, means that each contagion that appears within a human ocular frame as a body differs in every repetition. No sex can be homogenous at any level. From a Bergsonian durational perspective, neither sexual nor nonsexual forms of reproduction reproduce the same; that is, every repetition is a difference. Thus contrary to Grosz's assertion, there is nothing identical in identical twins, (not even genes).[73] Duration ensures the impossibility of, in Grosz's words, "reproduction of the same"; it also means that superseding sexual difference must be possible in evolutionary terms.

71. Hird, *The Origins of Sociable Life* (above, n. 10).

72. Donna J. Haraway, *When Species Meet* (Minneapolis: University of Minnesota Press, 2008); Hird, *The Origins of Sociable Life* (above, n. 10).

73. See, for example, Carl Bruder et al., "Phenotypically Concordant and Discordant Monozygotic Twins Display Different DNA Copy-Number-Variation Profiles," American Journal of Human Genetics 6:3 (2008): 763–771.

Perhaps, as Colebrook argues in "Sexual Indifference," sexual difference as ontology rehearses a fear about just the kind of excessive, prolific, species-crossing hyper-sex and reproduction evinced by the majority of life on earth. Life that can, without impediment, reproduce every twenty minutes or so; life that metabolized its way through DNA exchange and repair, multicellularity, and differentiation, and that eventuated—not as a foregone conclusion, but as contingency—in eukaryotic cells, plants, and animals. Why does neo-Darwinism compulsively insist that these astounding abilities and monumental creativity are primitive? Perhaps, rather than bacteria evincing "reproduction of the same" as Grosz claims, "the fear of sexual indifference—a circulation, exchange and proliferation beyond bounded forms—is precisely that which has imprisoned human species within its logic of self-enclosing sameness."[74] Sexual difference, Colebrook argues here, ironically rehearses a logic of sameness.

What does this suggest for sexual difference as ontology? Demarcating a hard difference between woman and man, and that there was an arboreal branching at some point in time whereby these entities, at the cultural, morphological, physical, reproductive, and all other levels, became permanently and irreversibly marked, requires a point in time and durational arrest. It is reminiscent of the fixed-species theory within creationism (the idea that God created all creatures in their present form) that Darwin's entire theory of evolution challenged. His painstaking lifetime of research led him to conclude that "it was almost impossible to mark a line where a variation with species stopped and where distinct species began—nature produced no lines of absolute demarcation."[75]

Colebrook reminds us that *creative evolution* is becoming: evolution is relentlessly on the move; there is no stasis in deep time. Sexual difference, she writes, might be continuous with differentiations already in place, and it might be continuous with its own ending:

> But what the substratum for becoming *is* can only be known after the event of becoming, and not as its logic. That is, it is never certain at what point a differentiation increases the complexity of a natural kind, or opens the first branching out of another natural kind. It cannot be clear, in other words, whether an event of sexual difference is the maximization of a being's continuity *or* the opening to its eventual annihilation or supplementation.[76]

74. Colebrook, "Sexual Indifference" (above, n. 50), p. 181.

75. Stott, *Darwin and the Barnacle* (above, n. 47), pp. 241–242.

76. Colebrook, "Sexual Indifference" (above, n. 50), p. 178.

Since nature is durational for all the contagions we call "organisms," sexual difference, as an indelible mark, would have to be a *becoming less*. Pressing the point, Colebrook cautions that an ontology of sexual difference may ultimately lead to human extinction through our very unwillingness to think of inhuman difference: "we might say that the event that will ultimately precipitate human extinction is not its radical openness to dissolution but its suicidal self-enclosure, its self-bounded integrity that will allow it only to imagine its own world from its own imaginative horizon."[77]

Digesting Difference: Metabolism as Force

"Politics" writes Hannah Landecker, "to a certain extent depends on where you put your difference—or where you look for it."[78] In her recent article, Landecker draws our attention to the ways in which food has widened its scope within nutritional epigenetics to become a conditioning environment effecting both genes and physiology. In the remainder of this essay, I want to consider metabolism as a foil to sexual difference. What I mean here is that I want to think through the myriad contradictions and problems opened up by sexual difference as ontology through a phenomenon that evolutionary theorists and biologists consider both primary and essential to life. I want to consider Landecker's provocation that politics depends on where we put our difference, and explore a feminist politics based on metabolic contagion rather than sexual difference. What might feminist politics, in other words, look like from the difference that metabolism makes? To begin to address this question, I steer away from difference, sexual or otherwise, as ontology and toward metabolism as force. As such, I return to Grosz's discussion of difference as force (outlined at the outset of this essay) before difference is rendered an ontology.

Metabolism—those seemingly mundane actions through which organisms maintain, develop, and respond—is derived from the Greek word *change* or *out-throw*. Metabolism includes ingestion, digestion, and transport. All organisms metabolize, and have done since LUCA, our last universal common ancestor who metabolized energy from light or chemicals. Preceding reproduction, metabolism is the force by which life continues to produce itself.

Metabolism sustains the biosphere. It relentlessly recycles materials, providing energy for life and nonlife. The earth's biosphere is,

77. Ibid., p. 172.

78. Hannah Landecker, "Food as Exposure: Nutritional Epigenetics and the New Metabolism," *BioSocieties* 6 (2011): 167–194.

in a quite literal sense, "an extension of the metabolism of evolving bacteria."[79] When an organism or cell dies it is metabolized. Metabolism enables the biosphere to recycle. When nitrogen moves from the atmosphere into the soil, nitrogen-fixing bacteria metabolize it into ammonium ions, which plants metabolize. Animals metabolize plants, converting them into cell proteins. Humans and other animals excrete nitrogeneous waste in, among other things, uric acid (in urine). In the soil or a waste-treatment facility, bacteria metabolize the nitrogen back into ammonium ions; some bacteria metabolize the nitrogen back into nitrogen gas.[80] We are stardust through carbon metabolism—or, put another way, "we have been recycled for the past 3,000 million years."[81] The earth's biosphere is oxygen-rich thanks to the billions of bacteria that died in what scientists refer to as the "oxygen holocaust." This single greatest mass killing of living organisms on earth occurred when oxygen-producing bacteria multiplied and spread, killing the vast majority of organisms for which oxygen was poisonous.

Modern biology is built on the analysis of the interaction of discrete entities (cells, organisms, populations) with their environment, which might be other cells and so on. What defines a cell or organism has as much to do with its separation from the environment as it has with the articulation of a membrane or another physical structure or process. As such, metabolism is typically described as the exchange of energy and matter with the environment. However, metabolism might be better characterized as an entangling force insofar as it defines a relationship between nondiscrete entities, themselves already entangled. In other words, through metabolism, environment becomes organism, and organism becomes environment. The environment, as Richard Lewontin and Richard Levins argue, "does not exist . . . because every species, not only the human species, is at every moment constructing and destroying the world it inhabits."[82]

Landecker makes this important point with regard to epigenetics and the molecularization of food.[83] An emerging relational biology,

79. Lynn Margulis and Dorion Sagan, *What Is Life?* (Berkeley: University of California Press, 1995), p. 89.

80. Tyler Volk and Dorion Sagan, *Death & Sex* (White River Junction, VT: Chelsea Green Publishing, 2009).

81. Margulis and Sagan, *What Is Life?* (above, n. 79).

82. Richard Lewontin and Richard Levins, "Organism and Environment," *Capitalism Nature Socialism* 8:2 (1997): 95–98, quote on p. 98.

83. Landecker, "Food as Exposure" (above, n. 78).

she writes, is concerned less with the qualities that compose a given bounded biological entity and more with a biology "of the in between."[84] These "profound changes to the material and conceptual constitution of 'environment'" enable biologists to think about the (human) animal body as sustained not through the food it currently eats, but by the food it has previously ingested that has become part of the body itself.[85] The starving body metabolizes itself, and insofar as we consume entities that have their own metabolisms, such as bacteria, fungi, plants, and animals, we are what we eat eats.[86] Millions of bacteria like those found in rumens, termite guts, and human intestines live symbiotically with animals and other organisms, metabolizing food. "We," as Haraway points out, have an intimacy with these tiny messmates that literally defines our survival.[87] And in the case of deep-time symbiogenesis—failed digestion that led to the development of eukaryotes such as (human) animals—the environment *becomes* the (new) organism: *metabolism is becoming*. Epigenetics is exploring this very concept, with the finding that the quantity and quality of food eaten by a parent (the so-called outside environment) affects the constitution (inside environment) of the body, thereby affecting the potential of genes to be expressed.

"Eating well," Derrida observes, is never done alone.[88] Fermenting bacteria, metabolizing small organic compounds for chemical energy and food, were the first producers. And bacteria's progeny, including plants and animals, maintain bacterial metabolism. Photosynthesis, perhaps the earth's most important metabolic innovation, enabled life to thrive from the sun as an abundant energy source. The molecule ATP, discussed earlier, is a form of metabolism that enables organisms to store energy for when it is needed rather than having to rely upon an energy source's availability. All animals are, metabolically, *consumers*—heterotrophs must use ready-made organic compounds. We are entirely dependent on fungi and plants, which, in turn, are dependent on autotrophic bacteria. Autotrophic bacteria, by contrast, do not "eat"—they "fix" or otherwise convert the elements upon which all living organisms depend. These bacte-

84. Ibid., p. 168. See also Elizabeth A. Wilson, "Gut Feminism," *Differences: A Journal of Feminist Cultural Studies* 15:3 (2004): 66–94.

85. Landecker, "Food as Exposure" (above, n. 78), p. 169.

86. Ibid., pp. 181–182.

87. Haraway, *When Species Meet* (above, n. 72).

88. Jacques Derrida, '"Eating Well' or the Calculation of the Subject: An Interview with Jacques Derrida," in *Who Comes After the Subject?*, ed. Eduardo Cadava, Peter Connor, and Jean-Luc Nancy (New York: Routledge, 1991), pp. 96–119.

ria are *producers,* engaging in a different economy of eating and thus relating with the world.

Given our relation to the biosphere as consumers, it is unsurprising that humans focus so much on eating. As Michael Pollan notes,

> 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 coevolved to the point where our fates are deeply entwined. . . . Eating puts us in touch with all that we share with the other animals, and all that sets us apart. It defines us.[89]

Earth-systems science and microbiology focus on metabolism as the generative force of the biosphere and all of its living inhabitants. Pollan draws our attention to metabolism's intimacy with culture. Culture, as Grosz points out, is not any sort of logical culmination or going-beyond nature; nature cannot be overcome by culture, or culture by nature—they are the same process. Just as evolution is built on successive and relentless "self-overcoming," so also is feminist and antiracist politics: "The logic by which this self-overcoming occurs is the same for natural as for social forces."[90] Little wonder, then, that cultures are so intensely defined through aspects of metabolism, including taste, ritual (for example, food preparation, consumption, and disposal; ceremonies; rights of passage, and so on), intolerances, allergies, and so on. The short time of human history is punctuated, at every turn and in every culture, by metabolism as a foundational force: "We cannot help but ingest and in the act of ingestion and digestion are drawn into the social, technical and political networks of food production, regulation and consumption. We are what we eat—but also what our parents and grandparents ate, and what we eat ate, and other expansions of networks of significant ingestions."[91] Contemporary biomedical sciences of metabolism are interested in the ways in which metabolic pathways evolve and build metabolic networks. Not only, this research suggests, do different individuals process the same food in different ways, but different cultures may well, over generations, create different metabolic networks, shaping the metabolic interface in different ways.[92] Metabolism circulates and generates novelty, then, in all strata of matter/culture.

89. Michael Pollan, *The Omnivore's Dilemma* (New York: Penguin Books, 2007), p. 10.

90. Ibid., pp. 40–41.

91. Landecker, "Food as Exposure" (above, n. 78), p. 187.

92. Ibid.

The forgoing discussion might suggest that metabolism is confined to the organic or living. Yet we could equally discuss how hurricanes metabolize wind, currents, air, temperature, and so on. If metabolism is *force*, then the demarcation of organic from inorganic and life from nonlife loses traction. This point is well-made by Kathryn Yusoff in her fascinating research on the *Gwion Gwion*, or "Bradshaw Art," in Western Australia.[93] Rather than focusing on art as a generative outcome of sexual difference, as Grosz does in *Becoming Undone*, Yusoff asks more startling and provocative questions about art and metabolism. Created by Aboriginal Australians, this rock art has remained colorful and vibrant for at least 40,000 years through fungal and bacterial metabolism. "Successive generations of these fungi [and bacteria] grow by cannibalising their predecessors."[94] Commenting on this enduring symbiosis between artists—*Chaetothyriales* fungi and red bacteria—Yusoff asks: Who are the subjects and who the artists? "Rather," she suggests, "than think both of these forms of subjectivity as hybrid, and thus a meeting between different species, the 'mixedness' of forces, forms and materialities might suggest a more mongrel operation, where difference is constituted by degree rather than kind, and subjects emerge *between natures*."[95]

Metabolism, as a generative force of the biosphere, invites provocative challenges to organismal autonomy, the demarcation of living from nonliving, organic from inorganic, and nature from culture. Metabolism is always on the move, and durational entangling networks are made and remade in evolution. Perhaps most importantly, metabolism jolts us from humanist preoccupations to an inhuman evolution. Bringing the discussion back to sexual difference, Colebrook keeps the question of sexual difference as ontology moving through an allusion to metabolism as an "other rhythm":

> Sexual *in*difference—or the forces of life, mutation, generation and exchange *without* any sense of ongoing identity or temporal synthesis—have always been warded off as evil and unthinkable, usually associated with a monstrous inhumanity. The shrill insistence on proper sexual difference—that creation must occur with a sense of continuity, intentionality, identity and dynamic self-be-

93. Kathryn Yusoff, "Mongrel Subjects: Nonhuman Origins, Art, and 40,000 Years of *Mixing It Up*," in *Subjectivity*, special issue on "Rethinking Hybridity: Interrogating Mixidness," ed. Y. Gunaratnam and Wendy Holloway (forthcoming).

94. Jack Pettigrew, qtd. in "Ancient Rock Art's Colours Come from Microbes," *BBC News: Science and Environment*, 28 December 2010. http://www.bbc.co.uk/news/science-environment-12039203.

95. Yusoff, "Mongrel Subjects" (above, n. 93).

> coming—precludes the organism from paying heed to those other rhythms that are now (for want of being perceived) exacerbating the annihilation of organic life. Had man recognized the inhuman—the monstrous mutations he has always warded off as evil, indifferent, and chaotically unbounded—he may have been more perturbed by those forces that are not of the life-world or intentional horizon, might have been able to face the encroaching sexual indifference that to date has been deemed to be unthinkable.[96]

Metabolism is a much more involved phenomenon than this outline details. This brief foray suggests that metabolism does much of the work that Grosz argues is required of ontology. Further, what makes sexual difference an ontology for Grosz is more appropriate to metabolism. Unlike sexual difference, metabolism is a force that extends all the way down, including cellular, physiological, cultural, and historical strata. It precedes sexual difference (indeed, the precursors to sexual reproduction—DNA repair, multicellularity, and differentiation—are outcomes of metabolic contagic activity), is common to all life (and, we might argue, nonlife), cannot be overcome, and is, quite literally, the "engine of life," as Grosz puts it. It is also highly generative, symbiogenetically creating, among other things, eukaryotes like plants and animals through digestion.

As sexual difference's foil, metabolism invites reflections upon sexual difference as ontology, and as such, keeps an ontology of sexual difference open as a question rather than forgone conclusion. Metabolism magnifies the tensions and contradictions, outlined in this essay, that sexual difference raises, including humanist versus nonhumanist assumptions, the demarcation of linear time rather than duration, sexual difference's reliance upon a gene-centric logic, the conflation of sexual difference with sexual reproduction and the erroneous assumption that heterosexual difference generates the most (and/or best) variation, and the fallacy of bounded organisms. Metabolism as universal and inalienable might suggest its status as an ontology, but I argue that it is better characterized as a force. Metabolism as force recognizes contagion as much as inalienable separation (from some original unified one to two) in linear time. Drawing out the problems in Irigaray's ontology of sexual difference, Kirby argues that sexual difference "is unable to disrupt our understanding of duration as a linear development of separate moments *in* time and *in* space—an archaeology."[97] Instead of marking a difference in linear time, metabolism as force recognizes con-

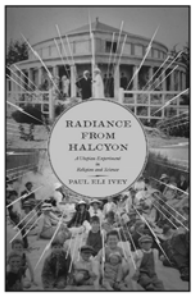
96. Colebrook, "Sexual Indifference" (above, n. 50), pp. 171–172.

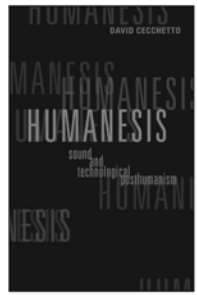
97. Kirby, *Quantum Anthropologies* (above, n. 51), p. 129.

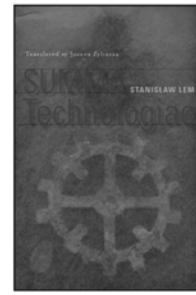
tagion rather than inalienable separation: contagion is always on the move. Sexual difference, as ontology, cannot endure because, as Grosz argues, "what endures . . . is not what remains unchanging or the same over time . . . but what diverges and transforms itself with the passage of time."[98] Refracting the title of Grosz's book suggests that becoming, the central point of Darwin's theory of evolution, is indeed undone if sexual difference is ontology.

98. Grosz, *Time Travels* (above, n. 14), p. 110.

Theory, Science, Technology







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