

Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter

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„Where did we ever get the strange idea that nature – as opposed to culture – is ahistorical and timeless? We are far too impressed by our own cleverness and self-consciousness. [...] We need to stop telling ourselves the same old anthropocentric bedtime stories.“ (Steve Shaviro 1997)

Language has been granted too much power. The linguistic turn, the semiotic turn, the interpretative turn, the cultural turn: it seems that at every turn lately every „thing“ – even materiality – is turned into a matter of language or some other form of cultural representation. The ubiquitous puns on „matter“ do not, alas, mark a rethinking of the key concepts (materiality and signification) and the relationship between them. Rather, it seems to be symptomatic of the extent to which matters of „fact“ (so to speak) have been replaced with matters of signification (no scare quotes here). Language matters. Discourse matters. Culture matters. There is an important sense in which the only thing that does not seem to matter anymore is matter.

What compels the belief that we have a direct access to cultural representations and their content that we lack toward the things represented? How did language come to be more trustworthy than matter? Why are language and culture granted their own agency and historicity while matter is figured as passive and immutable, or at best inherits a potential for change derivatively from language and culture? How does one even go about inquiring after the material conditions that have led us to such a brute reversal of naturalist beliefs when materiality itself is always already figured within a linguistic domain as its condition of possibility?

It is hard to deny that the power of language has been substantial. One might argue too substantial, or perhaps more to the point, too substantializing. Neither an exaggerated faith in the power of language nor the expressed concern that language is being granted too much power is a novel apprehension specifically attached to the early twenty-first century. For example, during the nineteenth century Nietzsche warned against the mistaken tendency to take grammar too seriously: allowing linguistic structure to shape or determine our understanding of the world, believing that the subject and predicate structure of language reflects a prior ontological reality of substance and attribute. The belief that grammatical categories reflect the underlying structure of the world is a continuing seductive habit of mind worth questioning. Indeed, the representationalist belief in the power of words to mirror preexisting phenomena is the metaphysical substrate that supports social constructivist, as well as traditional realist, beliefs. Significantly, social constructivism has been the object of intense scrutiny within both feminist and science studies circles where considerable and informed dissatisfaction has been voiced.¹

A *performative* understanding of discursive practices challenges the representationalist belief in the power of words to represent preexisting things. Performativity, properly construed, is not an invitation to turn everything (including material bodies) into words; on the contrary, performativity is precisely a contestation of the excessive power granted to language to determine what is real. Hence, in ironic contrast to the misconception that would equate performativity with a form of linguistic monism that takes language to be the stuff of reality, performativity is actually a contestation of the unexamined habits of mind that grant language and other forms of representation more power in determining our ontologies than they deserve.²

The move toward performative alternatives to representationalism shifts the focus from questions of correspondence between descriptions and reality (e.g., do they mirror nature or culture?) to matters of practices/doings/actions. I would argue that these approaches also bring to the forefront important questions of ontology, materiality, and agency, while

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1 Dissatisfaction surfaces in the literature in the 1980s. See, e.g., Donna Haraway's „Gender for a Marxist Dictionary: The Sexual Politics of a Word“ (originally published 1987) and „Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective“ (originally published 1988); both reprinted in Haraway 1991. See also Butler 1989.

2 This is not to dismiss the valid concern that certain specific performative accounts too much power to language. Rather, the point is that this is not an inherent feature of performativity but an ironic malady.

social constructivist approaches get caught up in the geometrical optics of reflection where, much like the infinite play of images between two facing mirrors, the epistemological gets bounced back and forth, but nothing more is seen. Moving away from the representationalist trap of geometrical optics, I shift the focus to physical optics, to questions of diffraction rather than reflection. Diffractively reading the insights of feminist and queer theory and science studies approaches through one another entails thinking the „social“ and the „scientific“ together in an illuminating way. What often appears as separate entities (and separate sets of concerns) with sharp edges does not actually entail a relation of absolute exteriority at all. Like the diffraction patterns illuminating the indefinite nature of boundaries – displaying shadows in „light“ regions and bright spots in „dark“ regions – the relation of the social and the scientific is a relation of „exteriority within“. This is not a static relationality but a doing – the enactment of boundaries – that always entails constitutive exclusions and therefore requisite questions of accountability.³ My aim is to contribute to efforts to sharpen the theoretical tool of performativity for science studies and feminist and queer theory endeavors alike, and to promote their mutual consideration. In this article, I offer an elaboration of performativity – a materialist, naturalist, and posthumanist elaboration – that allows matter its due as an active participant in the world's becoming, in its ongoing „intra-activity“. ⁴ It is vitally important that we understand how matter matters.

From representationalism to performativity

„People represent. That is part of what it is to be a person.
[...] Not *homo faber*, I say, but *homo depictor*.“
(Ian Hacking 1983: 144, 132)

Liberal social theories and theories of scientific knowledge alike owe much to the idea that the world is composed of individuals – presumed to

3 Haraway proposes the notion of diffraction as a metaphor for rethinking the geometry and optics of relationality: „[F]eminist theorist Trinh Minh-ha [...] was looking for a way to figure ‚difference‘ as a ‚critical difference within‘, and not as special taxonomic marks grounding difference as apartheid. [...] Diffraction does not produce ‚the same‘ displaced, as reflection and refraction do. Diffraction is a mapping of interference, not of replication, reflection, or reproduction. A diffraction pattern does not map where differences appear, but rather maps where the effects of differences appear“ (Haraway 1992: 300). Haraway (1997) promotes the notion of diffraction to a fourth semiotic category. Inspired by her suggestions for usefully deploying this rich and fascinating physical phenomenon to think about differences that matter, I further elaborate the notion of diffraction as a mutational critical tool of analysis (though not as a fourth semiotic category) in my forthcoming book (Barad forthcoming).

4 See Rouse 2002 on rethinking naturalism. The neologism *intra-activity* is defined below.

exist before the law, or the discovery of the law – awaiting/inviting representation. The idea that beings exist as individuals with inherent attributes, anterior to their representation, is a metaphysical presupposition that underlies the belief in political, linguistic, and epistemological forms of representationalism. Or, to put the point the other way around, representationalism is the belief in the ontological distinction between representations and that which they purport to represent; in particular, that which is represented is held to be independent of all practices of representing. That is, there are assumed to be two distinct and independent kinds of entities – representations and entities to be represented. The system of representation is sometimes explicitly theorized in terms of a tripartite arrangement. For example, in addition to knowledge (i.e., representations), on the one hand, and the known (i.e., that which is purportedly represented), on the other, the existence of a knower (i.e., someone who does the representing) is sometimes made explicit. When this happens it becomes clear that representations serve a mediating function between independently existing entities. This taken-for-granted ontological gap generates questions of the accuracy of representations. For example, does scientific knowledge accurately represent an independently existing reality? Does language accurately represent its referent? Does a given political representative, legal counsel, or piece of legislation accurately represent the interests of the people allegedly represented?

Representationalism has received significant challenge from feminists, poststructuralists, postcolonial critics, and queer theorists. The names of Michel Foucault and Judith Butler are frequently associated with such questioning. Butler sums up the problematics of political representationalism as follows:

„Foucault points out that juridical systems of power *produce* the subjects they subsequently come to represent. Juridical notions of power appear to regulate political life in purely negative terms. [...] But the subjects regulated by such structures are, by virtue of being subjected to them, formed, defined, and reproduced in accordance with the requirements of those structures. If this analysis is right, then the juridical formation of language and politics that represents women as ‚the subject‘ of feminism is itself a discursive formation and effect of a given version of representationalist politics. And the feminist subject turns out to be discursively constituted by the very political system that is supposed to facilitate its emancipation.“ (Butler 1990: 2)

In an attempt to remedy this difficulty, critical social theorists struggle to formulate understandings of the possibilities for political intervention that go beyond the framework of representationalism.

The fact that representationalism has come under suspicion in the domain of science studies is less well known but of no less significance. Critical examination of representationalism did not emerge until the

study of science shifted its focus from the nature and production of scientific knowledge to the study of the detailed dynamics of the actual practice of science. This significant shift is one way to coarsely characterize the difference in emphasis between separate multiple disciplinary studies of science (e.g., history of science, philosophy of science, sociology of science) and science studies. This is not to say that all science studies approaches are critical of representationalism; many such studies accept representationalism unquestioningly. For example, there are countless studies on the nature of scientific representations (including how scientists produce them, interpret them, and otherwise make use of them) that take for granted the underlying philosophical viewpoint that gives way to this focus – namely, representationalism. On the other hand, there has been a concerted effort by some science studies researchers to move beyond representationalism.

Ian Hacking's *Representing and Intervening* (1983) brought the question of the limitations of representationalist thinking about the nature of science to the forefront. The most sustained and thoroughgoing critique of representationalism in philosophy of science and science studies is to be found in the work of philosopher of science Joseph Rouse. Rouse has taken the lead in interrogating the constraints that representationalist thinking places on theorizing the nature of scientific practices.⁵ For example, while the hackneyed debate between scientific realism and social constructivism moved frictionlessly from philosophy of science to science studies, Rouse (1996) has pointed out that these adversarial positions have more in common than their proponents acknowledge. Indeed, they share representationalist assumptions that foster such endless debates: both scientific realists and social constructivists believe that scientific knowledge (in its multiple representational forms such as theoretical concepts, graphs, particle tracks, photographic images) mediates our access to the material world; where they differ is on the question of referent, whether scientific knowledge represents things in the world as they really are (i.e., „Nature“) or „objects“ that are the product of social activities (i.e., „Culture“), but both groups subscribe to representationalism.

Representationalism is so deeply entrenched within Western culture that it has taken on a commonsense appeal. It seems inescapable, if not

5 Rouse begins his interrogation of representationalism in *Knowledge and Power* (1987). He examines how a representationalist understanding of knowledge gets in the way of understanding the nature of the relationship between power and knowledge. He continues his critique of representationalism and the development of an alternative understanding of the nature of scientific practices in *Engaging Science* (1996). Rouse proposes that we understand science practice as ongoing patterns of situated activity, an idea that is then further elaborated in *How Scientific Practices Matter* (2002).

downright natural. But representationalism (like „nature itself“, not merely our representations of it!) has a history. Hacking traces the philosophical problem of representations to the Democritean dream of atoms and the void. According to Hacking's anthropological philosophy, representations were unproblematic prior to Democritus: „the word ‚real‘ first meant just unqualified likeness“ (Rouse 1996: 142). With Democritus's atomic theory emerges the possibility of a gap between representations and represented – „appearance“ makes its first appearance. Is the table a solid mass made of wood or an aggregate of discrete entities moving in the void? Atomism poses the question of which representation is real. The problem of realism in philosophy is a product of the atomistic worldview.

Rouse identifies representationalism as a Cartesian by-product – a particularly inconspicuous consequence of the Cartesian division between „internal“ and „external“ that breaks along the line of the knowing subject. Rouse brings to light the asymmetrical faith in word over world that underlines the nature of Cartesian doubt:

„I want to encourage doubt about [the] presumption that representations (that is, their meaning or content) are more accessible to us than the things they supposedly represent. If there is no magic language through which we can unerringly reach out directly to its referents, why should we think there is nevertheless a language that magically enables us to reach out directly to its sense or representational content? The presumption that we can know what we mean, or what our verbal performances say, more readily than we can know the objects those sayings are about is a Cartesian legacy, a linguistic variation on Descartes' insistence that we have a direct and privileged access to the contents of our thoughts that we lack towards the ‚external‘ world.“ (Rouse 1996: 209)

In other words, the asymmetrical faith in our access to representations over things is a contingent fact of history and not a logical necessity; that is, it is simply a Cartesian habit of mind. It takes a healthy skepticism toward Cartesian doubt to be able to begin to see an alternative.⁶

Indeed, it is possible to develop coherent philosophical positions that deny that there are representations on the one hand and ontologically separate entities awaiting representation on the other. A performative understanding, which shifts the focus from linguistic representations to discursive practices, is one such alternative. In particular, the search for alternatives to social constructivism has prompted performative ap-

6 The allure of representationalism may make it difficult to imagine alternatives. I discuss performative alternatives below, but these are not the only ones. A concrete historical example may be helpful at this juncture. Foucault points out that in sixteenth-century Europe, language was not thought of as a medium; rather, it was simply „one of the figurations of the world“ (Foucault 1970: 56), an idea that reverberates in a mutated form in the posthumanist performative account that I offer.

proaches in feminist and queer studies, as well as in science studies. Judith Butler's name is most often associated with the term *performativity* in feminist and queer theory circles. And while Andrew Pickering has been one of the very few science studies scholars to take ownership of this term, there is surely a sense in which science studies theorists such as Donna Haraway, Bruno Latour, and Joseph Rouse also propound performative understandings of the nature of scientific practices.⁷ Indeed, *performativity* has become a ubiquitous term in literary studies, theater studies, and the nascent interdisciplinary area of performance studies, prompting the question as to whether all performances are performative.⁸ In this article, I propose a specifically posthumanist notion of performativity – one that incorporates important material and discursive, social and scientific, human and nonhuman, and natural and cultural factors. A posthumanist account calls into question the givenness of the differential categories of „human“ and „nonhuman“, examining the practices through which these differential boundaries are stabilized and destabi-

7 Andrew Pickering (1995) explicitly eschews the representationalist idiom in favor of a performative idiom. It is important to note, however, that Pickering's notion of performativity would not be recognizable as such to poststructuralists, despite their shared embrace of *performativity* as a remedy to representationalism, and despite their shared rejection of humanism. Pickering's appropriation of the term does not include any acknowledgement of its politically important – arguably inherently queer – genealogy (see Sedgwick 1993) or why it has been and continues to be important to contemporary critical theorists, especially feminist and queer studies scholars/activists. Indeed, he evacuates its important political historicity along with many of its crucial insights. In particular, Pickering ignores important discursive dimensions, including questions of meaning, intelligibility, significance, identity formation, and power, which are central to poststructuralist invocations of „performativity“. And he takes for granted the humanist notion of agency as a *property* of individual entities (such as humans, but also weather systems, scallops, and stereotypes), which poststructuralists problematize. On the other hand, poststructuralist approaches fail to take account of „nonhuman agency“, which is a central focus of Pickering's account. See Barad (forthcoming) for a more detailed discussion.

8 The notion of performativity has a distinguished career in philosophy that most of these multiple and various engagements acknowledge. Performativity's lineage is generally traced to the British philosopher J. L. Austin's interest in speech acts, particularly the relationship between saying and doing. Jacques Derrida is usually cited next as offering important poststructuralist amendments. Butler elaborates Derrida's notion of performativity through Foucault's understanding of the productive effects of regulatory power in theorizing the notion of identity performatively. Butler introduces her notion of gender performativity in *Gender Trouble*, where she proposes that we understand gender not as a thing or a set of free-floating attributes, not as an essence – but rather as a „doing“: „gender is itself a kind of becoming or activity [...] gender ought not to be conceived as a noun or a substantial thing or a static cultural marker, but rather as an incessant and repeated action of some sort“ (Butler 1990: 112). In *Bodies That Matter* (1993) Butler argues for a linkage between gender performativity and the materialization of sexed bodies. Eve Kosofsky Sedgwick (1993) argues that performativity's genealogy is inherently queer.

lized.⁹ Donna Haraway's scholarly opus – from primates to cyborgs to companion species – epitomizes this point.

If performativity is linked not only to the formation of the subject but also to the production of the matter of bodies, as Butler's account of „materialization“ and Haraway's notion of „materialized refiguration“ suggest, then it is all the more important that we understand the nature of this production.¹⁰ Foucault's analytic of power links discursive practices to the materiality of the body. However, his account is constrained by several important factors that severely limit the potential of his analysis and Butler's performative elaboration, thereby forestalling an understanding of precisely *how* discursive practices produce material bodies.

If Foucault, in queering Marx, positions the body as the locus of productive forces, the site where the large-scale organization of power links up with local practices, then it would seem that any robust theory of the materialization of bodies would necessarily take account of *how the body's materiality* – for example, its anatomy and physiology – *and other material forces actively matter to the processes of materialization*. Indeed, as Foucault makes crystal clear in the last chapter of *The History of Sexuality* (vol. 1), he is not out to deny the relevance of the physical body but, on the contrary, to

„[...] show how the deployments of power are directly connected to the body – to bodies, functions, physiological processes, sensations, and pleasures; far from the body having to be effaced, what is needed is to make it visible through an analysis in which the biological and the historical are not consecutive to one another [...] but are bound together in an increasingly complex fashion in accordance with the development of the modern technologies of power that take life as their objective. Hence, I do not envision a „history of mentalities“ that would take account of bodies only through the manner in which they have been perceived and given meaning and value; but a „history of bodies“ and the manner in which what is most material and most vital in them has been invested.“ (Foucault 1980a: 151-152)

⁹ This notion of posthumanism differs from Pickering's idiosyncratic assignment of a „posthumanist space [as] a space in which the human actors are still there but now inextricably entangled with the nonhuman, no longer at the center of the action calling the shots“ (Pickering 1995: 26). However, the decentering of the human is but one element of posthumanism. (Note that Pickering's notion of „entanglement“ is explicitly epistemological, not ontological. What is at issue for him in dubbing his account „posthumanist“ is the fact that it is attentive to the mutual accommodation, or responsiveness, of human and nonhuman agents.)

¹⁰ It could be argued that „materialized refiguration“ is an *enterprised up* (Haraway's term) version of „materialization“, while the notion of „materialization“ hints at a richer account of the former. Indeed, it is possible to read my posthumanist performative account along these lines, as a diffractive elaboration of Butler's and Haraway's crucial insights.

On the other hand, Foucault does not tell us in what way the biological and the historical are „bound together“ such that one is not consecutive to the other. What is it about the materiality of bodies that makes it susceptible to the enactment of biological and historical forces simultaneously? To what degree does the matter of bodies have its own historicity? Are social forces the only ones susceptible to change? Are not biological forces in some sense always already historical ones? Could it be that there is some important sense in which historical forces are always already biological? What would it mean to even ask such a question given the strong social constructivist undercurrent in certain interdisciplinary circles in the early twenty-first century? For all Foucault's emphasis on the political anatomy of disciplinary power, he too fails to offer an account of the body's historicity in which its very materiality plays an *active* role in the workings of power. This implicit reinscription of matter's passivity is a mark of extant elements of representationalism that haunt his largely postrepresentationalist account.¹¹ This deficiency is importantly related to his failure to theorize the relationship between „discursive“ and „nondiscursive“ practices. As materialist feminist theorist Rosemary Hennessey insists in offering her critique of Foucault, „a rigorous materialist theory of the body cannot stop with the assertion that the body is always discursively constructed. It also needs to explain how the discursive construction of the body is related to nondiscursive practices in ways that vary widely from one social formation to another“ (Hennessey 1993: 46).

Crucial to understanding the workings of power is an understanding of the nature of power in the fullness of its materiality. To restrict power's productivity to the limited domain of the „social“, for example, or to figure matter as merely an end product rather than an active factor in further materializations, is to cheat matter out of the fullness of its capacity. How might we understand not only how human bodily contours are constituted through psychic processes but how even the very atoms that make up the biological body come to matter and, more generally, how matter makes itself felt? It is difficult to imagine how psychic and sociohistorical forces alone could account for the production of matter. Surely it is the case – even when the focus is restricted to the materiality of „human“ bodies – that there are „natural“, not merely „social“, forces that matter. Indeed, there is a host of material-discursive forces – including ones that get labeled „social“, „cultural“, „psychic“, „economic“, „natural“, „physical“, „biological“, „geopolitical“, and „geological“ – that may be important to particular (entangled) processes of materialization. If we follow disciplinary habits of tracing disciplinary-defined causes through to the corresponding disciplinary-defined effects, we will

¹¹ See also Butler 1989.

miss all the crucial intra-actions among these forces that fly in the face of any specific set of disciplinary concerns.¹²

What is needed is a robust account of the materialization of *all* bodies – „human“ and „nonhuman“ – and the material-discursive practices by which their differential constitutions are marked. This will require an understanding of the nature of the relationship between discursive practices and material phenomena, an accounting of „nonhuman“ as well as „human“ forms of agency, and an understanding of the precise causal nature of productive practices that takes account of the fullness of matter's implication in its ongoing historicity. My contribution toward the development of such an understanding is based on a philosophical account that I have been calling „agential realism“. Agential realism is an account of technoscientific and other practices that takes feminist, anti-racist, poststructuralist, queer, Marxist, science studies, and scientific insights seriously, building specifically on important insights from Niels Bohr, Judith Butler, Michel Foucault, Donna Haraway, Vicki Kirby, Joseph Rouse, and others.¹³ It is clearly not possible to fully explicate these ideas here. My more limited goal in this article is to use the notion of performativity as a diffraction grating for reading important insights from feminist and queer studies and science studies through one another while simultaneously proposing a materialist and posthumanist reworking of the notion of performativity. This entails a reworking of the familiar notions of discursive practices, materialization, agency, and causality, among others.

I begin by issuing a direct challenge to the metaphysical underpinnings of representationalism, proposing an agential realist ontology as an alternative. In the following section I offer a posthumanist performative reformulation of the notion of discursive practices and materiality and theorize a specific causal relationship between them. In the final section I discuss the agential realist conceptions of causality and agency that are vital to understanding the productive nature of material-discursive practices, including technoscientific ones.

12 The conjunctive term material-discursive and other agential realist terms like intra-action are defined below.

13 This essay outlines issues I developed in earlier publications including Barad 1996, 1998a, 1998b, 2001b, and in my forthcoming book.

Toward a performative metaphysics

„As long as we stick to things and words we can believe that we are speaking of what we see, that we see what we are speaking of, and that the two are linked.“ (Gilles Deleuze 1988: 65)

„Words and things‘ is the entirely serious title of a problem.“ (Michel Foucault 1972: 49)

Representationalism separates the world into the ontologically disjoint domains of words and things, leaving itself with the dilemma of their linkage such that knowledge is possible. If words are untethered from the material world, how do representations gain a foothold? If we no longer believe that the world is teeming with inherent resemblances whose signatures are inscribed on the face of the world, things already emblazoned with signs, words lying in wait like so many pebbles of sand on a beach there to be discovered, but rather that the knowing subject is enmeshed in a thick web of representations such that the mind cannot see its way to objects that are now forever out of reach and all that is visible is the sticky problem of humanity's own captivity within language, then it begins to become apparent that representationalism is a prisoner of the problematic metaphysics it postulates. Like the frustrated would-be runner in Zeno's paradox, representationalism never seems to be able to get any closer to solving the problem it poses because it is caught in the impossibility of stepping outward from its metaphysical starting place. Perhaps it would be better to begin with a different starting point, a different metaphysics.¹⁴

Thingification – the turning of relations into „things“, „entities“, „relata“ – infects much of the way we understand the world and our relationship to it.¹⁵ Why do we think that the existence of relations requires relata? Does the persistent distrust of nature, materiality, and the body that pervades much of contemporary theorizing and a sizable amount of

14 It is no secret that *metaphysics* has been a term of opprobrium through most of the twentieth century. This positivist legacy lives on even in the heart of its detractors. Poststructuralists are simply the newest signatories of its death warrant. Yet, however strong one's dislike of metaphysics, it will not abide by any death sentence, and so it is ignored at one's peril. Indeed, new „experimental metaphysics“ research is taking place in physics laboratories in the United States and abroad, calling into question the common belief that there is an inherent boundary between the „physical“ and the „metaphysical“ (see Barad forthcoming). This fact should not be too surprising to those of us who remember that the term *metaphysics* does not have some highbrow origins in the history of philosophy but, rather, originally referred to the writings of Aristotle that came after his writings on physics, in the arrangement made by Andronicus of Rhodes about three centuries after Aristotle's death.

15 *Relata* are would-be antecedent components of relations. According to meta-physical atomism, individual relata always preexist any relations that may hold between them.

the history of Western thought feed off of this cultural proclivity? In this section, I present a relational ontology that rejects the metaphysics of relata, of „words“ and „things“. On an agential realist account, it is once again possible to acknowledge nature, the body, and materiality in the fullness of their becoming without resorting to the optics of transparency or opacity, the geometries of absolute exteriority or interiority, and the theoretization of the human as either pure cause or pure effect while at the same time remaining resolutely accountable for the role „we“ play in the intertwined practices of knowing and becoming.

The postulation of individually determinate entities with inherent properties is the hallmark of atomistic metaphysics. Atomism hails from Democritus.¹⁶ According to Democritus the properties of all things derive from the properties of the smallest unit – atoms (the „uncuttable“ or „inseparable“). Liberal social theories and scientific theories alike owe much to the idea that the world is composed of individuals with separately attributable properties. An entangled web of scientific, social, ethical, and political practices, and our understanding of them, hinges on the various/differential instantiations of this presupposition. Much hangs in the balance in contesting its seeming inevitability.

Physicist Niels Bohr won the Nobel Prize for his quantum model of the atom, which marks the beginning of his seminal contributions to the development of the quantum theory.¹⁷ Bohr's philosophy-physics (the two were inseparable for him) poses a radical challenge not only to Newtonian physics but also to Cartesian epistemology and its representationalist triadic structure of words, knowers, and things. Crucially, in a stunning reversal of his intellectual forefather's schema, Bohr rejects the atomistic metaphysics that takes „things“ as ontologically basic entities. For Bohr, things do not have inherently determinate boundaries or properties, and words do not have inherently determinate meanings. Bohr also calls into question the related Cartesian belief in the inherent distinction between subject and object, and knower and known.

It might be said that the epistemological framework that Bohr develops rejects both the transparency of language and the transparency of

16 Atomism is said to have originated with Leucippus and was further elaborated by Democritus, devotee of democracy, who also explored its anthropological and ethical implications. Democritus's atomic theory is often identified as the most mature pre-Socratic philosophy, directly influencing Plato and Epicurus, who transmitted it into the early modern period. Atomic theory is also said to form the cornerstone of modern science.

17 Niels Bohr (1885 – 1962), a contemporary of Einstein, was one of the founders of quantum physics and also the most widely accepted interpretation of the quantum theory, which goes by the name of the Copenhagen interpretation (after the home of Bohr's internationally acclaimed physics institute that bears his name). On my reading of Bohr's philosophy-physics, Bohr can be understood as proposing a protoperformative account of scientific practices.

measurement; however, even more fundamentally, it rejects the presupposition that language and measurement perform mediating functions. Language does not represent states of affairs, and measurements do not represent measurement-independent states of being. Bohr develops his epistemological framework without giving in to the despair of nihilism or the sticky web of relativism. With brilliance and finesse, Bohr finds a way to hold on to the possibility of objective knowledge while the grand structures of Newtonian physics and representationalism begin to crumble.

Bohr's break with Newton, Descartes, and Democritus is not based in „mere idle philosophical reflection“ but on new empirical findings in the domain of atomic physics that came to light during the first quarter of the twentieth century. Bohr's struggle to provide a theoretical understanding of these findings resulted in his radical proposal that an entirely new epistemological framework is required. Unfortunately, Bohr does not explore crucial ontological dimensions of his insights but rather focuses on their epistemological import. I have mined his writings for his implicit ontological views and have elaborated on them in the development of an agential realist ontology. In this section, I present a quick overview of important aspects of Bohr's account and move on to an explication of an agential realist ontology. This relational ontology is the basis for my posthumanist performative account of the production of material bodies. This account refuses the representationalist fixation on „words“ and „things“ and the problematic of their relationality, advocating instead *a causal relationship between specific exclusionary practices embodied as specific material configurations of the world* (i.e., discursive practices/(con)figurations rather than „words“) and *specific material phenomena* (i.e., relations rather than „things“). This causal relationship between the apparatuses of bodily production and the phenomena produced is one of „agential intra-action“. The details follow.

According to Bohr, *theoretical concepts* (e.g., „position“ and „momentum“) are not ideational in character but rather *are specific physical arrangements*.¹⁸ For example, the notion of „position“ cannot be presumed to be a well-defined abstract concept, nor can it be presumed to be an inherent attribute of independently existing objects. Rather, „position“ only has meaning when a rigid apparatus with fixed parts is used (e.g., a ruler is nailed to a fixed table in the laboratory, thereby establishing a fixed frame of reference for specifying „position“). And furthermore, any measurement of „position“ using this apparatus cannot be attributed to some abstract independently existing „object“ but rather is a property

18 Bohr argues on the basis of this single crucial insight, together with the empirical finding of an inherent discontinuity in measurement „intra-actions“, that one must reject the presumed inherent separability of observer and observed, knower and known. See Barad 1996, forthcoming.

of the *phenomenon* – the inseparability of „observed object“ and „agencies of observation“. Similarly, „momentum“ is only meaningful as a material arrangement involving movable parts. Hence, the simultaneous indeterminacy of „position“ and „momentum“ (what is commonly referred to as the Heisenberg uncertainty principle) is a straightforward matter of the material exclusion of „position“ and „momentum“ arrangements (one requiring fixed parts and the complementary arrangement requiring movable parts).¹⁹

Therefore, according to Bohr, the primary epistemological unit is not independent objects with inherent boundaries and properties but rather *phenomena*. On my agential realist elaboration, phenomena do not merely mark the epistemological inseparability of „observer“ and „observed“; rather, *phenomena are the ontological inseparability of agentially intra-acting „components“*. That is, phenomena are ontologically primitive relations – relations without preexisting relata.²⁰ The notion of *intra-action* (in contrast to the usual „interaction“, which presumes the prior existence of independent entities/relata) represents a profound conceptual shift. It is through specific agential intra-actions that the boundaries and properties of the „components“ of phenomena become determinate and that particular embodied concepts become meaningful. A specific intra-action (involving a specific material configuration of the „apparatus of observation“) enacts an *agential cut* (in contrast to the Cartesian cut – an inherent distinction – between subject and object) effecting a separation between „subject“ and „object“. That is, the agential cut enacts a *local resolution within* the phenomenon of the inherent ontological indeterminacy. In other words, relata do not preexist relations; rather, relata-within-phenomena emerge through specific intra-actions. Crucially then, intra-actions enact *agential separability* – the local condition of *exteriority-within-phenomena*. The notion of agential separability is of fundamental importance, for in the absence of a classical ontological condition of exteriority between observer and observed it provides the condition for the possibility of objectivity. Moreover, the agential cut enacts a local causal structure among „components“ of a phenomenon in the marking of the „measuring agencies“ („effect“) by the „measured object“ („cause“). Hence, *the notion of intra-actions constitutes a reworking of the traditional notion of causality*.²¹

19 The so-called uncertainty principle in quantum physics is not a matter of „uncertainty“ at all but rather of indeterminacy. See Barad 1995, 1996, forthcoming.

20 That is, relations are not secondarily derived from independently existing „relata“, but rather the mutual ontological dependence of „relata“ – the relation – is the ontological primitive. As discussed below, relata only exist *within* phenomena as a result of specific intra-actions (i.e., there are no independent relata, only relata-within-relations).

21 A concrete example may be helpful. When light passes through a two-slit diffraction grating and forms a diffraction pattern it is said to exhibit wavelike behavior. But there is also evidence that light exhibits particlelike characteristics, called

In my further elaboration of this agential realist ontology, I argue that phenomena are not the mere result of laboratory exercises engineered by human subjects. Nor can the apparatuses that produce phenomena be understood as observational devices or mere laboratory instruments. Although space constraints do not allow an in-depth discussion of the agential realist understanding of the nature of apparatuses, since apparatuses play such a crucial, indeed constitutive, role in the production of phenomena, I present an overview of the agential realist theoretization of apparatuses before moving on to the question of the nature of phenomena. The proposed elaboration enables an exploration of the implications of the agential realist ontology beyond those specific to understanding the nature of scientific practices. In fact, agential realism offers an understanding of the nature of material-discursive practices, such as those very practices through which different distinctions get drawn, including those between the „social“ and the „scientific“.²²

Apparatuses are not inscription devices, scientific instruments set in place before the action happens, or machines that mediate the dialectic of resistance and accommodation. They are neither neutral probes of the natural world nor structures that deterministically impose some particular outcome. In my further elaboration of Bohr's insights, apparatuses are not mere static arrangements *in* the world, but rather *apparatuses are dynamic (re)configurings of the world, specific agential practices/intra-actions/performances through which specific exclusionary boundaries are enacted*. Apparatuses have no inherent „outside“ boundary. This indeterminacy of the „outside“ boundary represents the impossibility of closure – the ongoing intra-activity in the iterative reconfiguring of the apparatus of bodily production. Apparatuses are open-ended practices.

photons. If one wanted to test this hypothesis, the diffraction apparatus could be modified in such a way as to allow a determination of which slit a given photon passes through (since particles only go through a single slit at a time). The result of running this experiment is that the diffraction pattern is destroyed! Classically, these two results together seem contradictory – frustrating efforts to specify the true ontological nature of light. Bohr resolves this wave-particle duality paradox as follows: the objective referent is not some abstract, independently existing entity but rather the phenomenon of light intra-acting with the apparatus. The first apparatus gives determinate meaning to the notion of „wave“, while the second provides determinate meaning to the notion of „particle“. The notions of „wave“ and „particle“ do not refer to inherent characteristics of an object that precedes its intra-action. *There are no such independently existing objects with inherent characteristics*. The two different apparatuses effect different cuts, that is, draw different distinctions delineating the „measured object“ from the „measuring instrument“. In other words, they differ in their local material resolutions of the inherent ontological indeterminacy. There is no conflict because the two different results mark different intra-actions. See Barad 1996, forthcoming for more details.

22 This elaboration is not based on an analogical extrapolation. Rather, I argue that such anthropocentric restrictions to laboratory investigations are not justified and indeed defy the logic of Bohr's own insights. See Barad forthcoming.

Importantly, apparatuses are themselves phenomena. For example, as scientists are well aware, apparatuses are not preformed interchangeable objects that sit atop a shelf waiting to serve a particular purpose. Apparatuses are constituted through particular practices that are perpetually open to rearrangements, rearticulations, and other reworkings. This is part of the creativity and difficulty of doing science: getting the instrumentation to work in a particular way for a particular purpose (which is always open to the possibility of being changed during the experiment as different insights are gained). Furthermore, any particular apparatus is always in the process of intra-acting with other apparatuses, and the enfolding of locally stabilized phenomena (which may be traded across laboratories, cultures, or geopolitical spaces only to find themselves differently materializing) into subsequent iterations of particular practices constitutes important shifts in the particular apparatus in question and therefore in the nature of the intra-actions that result in the production of new phenomena, and so on. Boundaries do not sit still.

With this background we can now return to the question of the nature of phenomena. Phenomena are produced through agential intra-actions of multiple apparatuses of bodily production. Agential intra-actions are specific causal material enactments that may or may not involve „humans“. Indeed, it is through such practices that the differential boundaries between „humans“ and „nonhumans“, „culture“ and „nature“, the „social“ and the „scientific“ are constituted. Phenomena are constitutive of reality. Reality is not composed of things-in-themselves or things-behind-phenomena but „things“-in-phenomena.²³ The world *is* intra-activity in its differential mattering. It is through specific intra-actions that a differential sense of being is enacted in the ongoing ebb and flow of agency. That is, it is through specific intra-actions that phenomena come to matter – in both senses of the word. The world is a dynamic process of intra-activity in the ongoing reconfiguring of locally determinate causal structures with determinate boundaries, properties, meanings, and patterns of marks on bodies. This ongoing flow of agency through which „part“ of the world makes itself differentially intelligible to another „part“ of the world and through which local causal structures, boundaries, and properties are stabilized and destabilized does not take place in space and time but in the making of spacetime itself. The world is an ongoing open process of mattering through which „mattering“ itself acquires meaning and form in the realization of different agential possibilities. Temporality and spatiality emerge in this processual historicity.

²³ Because phenomena constitute the ontological primitives, it makes no sense to talk about independently existing things as somehow behind or as the causes of phenomena. In essence, there are no noumena, only phenomena. Agential realist phenomena are neither Kant's phenomena nor the phenomenologist's phenomena.

Relations of exteriority, connectivity, and exclusion are reconfigured. The changing topologies of the world entail an ongoing reworking of the very nature of dynamics.

In summary, the universe is agential intra-activity in its becoming. The primary ontological units are not „things“ but phenomena dynamic topological reconfigurings / entanglements / relationalities / (re)articulations. And the primary semantic units are not „words“ but material-discursive practices through which boundaries are constituted. This dynamism *is* agency. Agency is not an attribute but the ongoing reconfigurings of the world. On the basis of this performative metaphysics, in the next section I propose a posthumanist refiguration of the nature of materiality and discursivity and the relationship between them, and a posthumanist account of performativity.

A posthumanist account of material-discursive practices

Discursive practices are often confused with linguistic expression, and meaning is often thought to be a property of words. Hence, discursive practices and meanings are said to be peculiarly human phenomena. But if this were true, how would it be possible to take account of the boundary-making practices by which the differential constitution of „humans“ and „nonhumans“ are enacted? It would be one thing if the notion of constitution were to be understood in purely epistemic terms, but it is entirely unsatisfactory when questions of ontology are on the table. If „humans“ refers to phenomena, not independent entities with inherent properties but rather beings in their differential becoming, particular material (re)configurings of the world with shifting boundaries and properties that stabilize and destabilize along with specific material changes in what it means to be human, then the notion of discursivity cannot be founded on an inherent distinction between humans and nonhumans. In this section, I propose a posthumanist account of discursive practices. I also outline a concordant reworking of the notion of materiality and hint at an agential realist approach to understanding the relationship between discursive practices and material phenomena.

Meaning is not a property of individual words or groups of words. Meaning is neither intralinguistically conferred nor extralinguistically referenced. Semantic contentfulness is not achieved through the thoughts or performances of individual agents but rather through particular discursive practices. With the inspiration of Bohr's insights, it would also be tempting to add the following agential realist points: meaning is not ideal but rather specific material (re)configurings of the world, and semantic indeterminacy, like ontological indeterminacy, is only locally resolvable through specific intra-actions. But before proceeding, it is

probably worth taking a moment to dispel some misconceptions about the nature of discursive practices.

Discourse is not a synonym for language.²⁴ Discourse does not refer to linguistic or signifying systems, grammars, speech acts, or conversations. To think of discourse as mere spoken or written words forming descriptive statements is to enact the mistake of representationalist thinking. Discourse is not what is said; it is that which constrains and enables what can be said. Discursive practices define what counts as meaningful statements. Statements are not the mere utterances of the originating consciousness of a unified subject; rather, statements and subjects emerge from a field of possibilities. This field of possibilities is not static or singular but rather is a dynamic and contingent multiplicity.

According to Foucault, discursive practices are the local sociohistorical material conditions that enable and constrain disciplinary knowledge practices such as speaking, writing, thinking, calculating, measuring, filtering, and concentrating. Discursive practices produce, rather than merely describe, the „subjects“ and „objects“ of knowledge practices. On Foucault's account these „conditions“ are immanent and historical rather than transcendental or phenomenological. That is, they are not conditions in the sense of transcendental, ahistorical, cross-cultural, abstract laws defining the possibilities of experience (Kant), but rather they are actual historically situated social conditions.

Foucault's account of discursive practices has some provocative resonances (and some fruitful dissonances) with Bohr's account of apparatuses and the role they play in the material production of bodies and meanings. For Bohr, apparatuses are particular physical arrangements that give meaning to certain concepts to the exclusion of others; they are the local physical conditions that enable and constrain knowledge practices such as conceptualizing and measuring; they are productive of (and part of) the phenomena produced; they enact a local cut that produces „objects“ of particular knowledge practices within the particular phenomena produced. On the basis of his profound insight that „concepts“ (which are actual physical arrangements) and „things“ do not have determinate boundaries, properties, or meanings apart from their mutual intra-actions, Bohr offers a new epistemological framework that calls into question the dualisms of object/subject, knower/known, nature/culture, and word/world.

Bohr's insight that concepts are not ideational but rather are actual physical arrangements is clearly an insistence on the materiality of meaning making that goes beyond what is usually meant by the frequently

24 I am concerned here with the Foucauldian notion of discourse (discursive practices), not formalist and empirical approaches stemming from Anglo-American linguistics, sociolinguistics, and sociology.

heard contemporary refrain that writing and talking are material practices. Nor is Bohr merely claiming that discourse is „supported“ or „sustained“ by material practices, as Foucault seems to suggest (though the nature of this „support“ is not specified), or that nondiscursive (background) practices determine discursive practices, as some existential-pragmatic philosophers purport.²⁵ Rather, Bohr's point entails a much more intimate relationship between concepts and materiality. In order to better understand the nature of this relationship, it is important to shift the focus from linguistic concepts to discursive practices.

On an agential realist elaboration of Bohr's theoretical framework, apparatuses are not static arrangements in the world that embody particular concepts to the exclusion of others; rather, apparatuses are specific material practices through which local semantic and ontological determinacy are intra-actively enacted. That is, apparatuses are the exclusionary practices of mattering through which intelligibility and materiality are constituted. Apparatuses are material (re)configurings/discursive practices that produce material phenomena in their discursively differentiated becoming. A phenomenon is a dynamic relationality that is locally determinate in its matter and meaning as mutually determined (within a particular phenomenon) through specific causal intra-actions. Outside of particular agential intra-actions, „words“ and „things“ are indeterminate. Hence, the notions of materiality and discursivity must be reworked in a way that acknowledges their mutual entailment. In particular, on an agential realist account, both materiality and discursive practices are rethought in terms of intra-activity.

On an agential realist account, discursive practices are specific material (re)configurings of the world through which local determinations of boundaries, properties, and meanings are differentially enacted. That is, discursive practices are ongoing agential intra-actions of the world through which local determinacy is enacted within the phenomena produced. Discursive practices are causal intra-actions – they enact local causal structures through which one „component“ (the „effect“) of the phenomenon is marked by another „component“ (the „cause“) in their differential articulation. Meaning is not a property of individual words or groups of words but an ongoing performance of the world in its differen-

25 Foucault makes a distinction between „discursive“ and „nondiscursive“ practices, where the latter category is reduced to social institutional practices: „The term ‚institution‘ is generally applied to every kind of more-or-less constrained behaviour, everything that functions in a society as a system of constraint and that isn't utterance, in short, *all the field of the non-discursive social, is an institution*“ (Foucault 1980b: 197-198; my italics). This specific social science demarcation is not particularly illuminating in the case of agential realism's posthumanist account, which is not limited to the realm of the social. In fact, it makes no sense to speak of the „nondiscursive“ unless one is willing to jettison the notion of causality in its intra-active conception.

tial intelligibility. In its causal intra-activity, „part“ of the world becomes determinately bounded and propertied in its emergent intelligibility to another „part“ of the world. Discursive practices are boundary-making practices that have no finality in the ongoing dynamics of agential intra-activity.

Discursive practices are not speech acts, linguistic representations, or even linguistic performances, bearing some unspecified relationship to material practices. Discursive practices are not anthropomorphic placeholders for the projected agency of individual subjects, culture, or language. Indeed, they are not human-based practices. On the contrary, agential realism's posthumanist account of discursive practices does not fix the boundary between „human“ and „nonhuman“ before the analysis ever gets off the ground but rather enables (indeed demands) a genealogical analysis of the discursive emergence of the „human“. „Human bodies“ and „human subjects“ do not preexist as such; nor are they mere end products. „Humans“ are neither pure cause nor pure effect but part of the world in its open-ended becoming.

Matter, like meaning, is not an individually articulated or static entity. Matter is not little bits of nature, or a blank slate, surface, or site passively awaiting signification; nor is it an uncontested ground for scientific, feminist, or Marxist theories. Matter is not a support, location, referent, or source of sustainability for discourse. Matter is not immutable or passive. It does not require the mark of an external force like culture or history to complete it. Matter is always already an ongoing historicity.²⁶

On an agential realist account, matter does not refer to a fixed substance; rather, matter is substance in its intra-active becoming – not a thing, but a doing, a congealing of agency. Matter is a stabilizing and destabilizing process of iterative intra-activity. Phenomena – the smallest material

26 In her critique of constructivism within feminist theory Judith Butler puts forward an account of materialization that seeks to acknowledge these important points. Reworking the notion of matter as a process of materialization brings to the fore the importance of recognizing matter in its historicity and directly challenges representationalism's construal of matter as a passive blank site awaiting the active inscription of culture and the representationalist positioning of the relationship between materiality and discourse as one of absolute exteriority. Unfortunately, however, Butler's theory ultimately reinscribes matter as a passive product of discursive practices rather than as an active agent participating in the very process of materialization. This deficiency is symptomatic of an incomplete assessment of important causal factors and an incomplete reworking of „causality“ in understanding the nature of discursive practices (and material phenomena) in their productivity. Furthermore, Butler's theory of materiality is limited to an account of the materialization of human bodies or, more accurately, to the construction of the contours of the human body. Agential realism's relational ontology enables a further reworking of the notion of materialization that acknowledges the existence of important linkages between discursive practices and material phenomena without the anthropocentric limitations of Butler's theory.

units (relational „atoms“) – come to matter through this process of ongoing intra-activity. That is, matter refers to the materiality/materialization of phenomena, not to an inherent fixed property of abstract independently existing objects of Newtonian physics (the modernist realization of the Democritean dream of atoms and the void).

Matter is not simply „a kind of citationality“ (Butler 1993: 15), the surface effect of human bodies, or the end product of linguistic or discursive acts. Material constraints and exclusions and the material dimensions of regulatory practices are important factors in the process of materialization. The dynamics of intra-activity entails matter as an *active* „agent“ in its ongoing materialization.

Boundary-making practices, that is, discursive practices, are fully implicated in the dynamics of intra-activity through which phenomena come to matter. In other words, materiality is discursive (i.e., material phenomena are inseparable from the apparatuses of bodily production: matter emerges out of and includes as part of its being the ongoing reconfiguring of boundaries), just as discursive practices are always already material (i.e., they are ongoing material (re)configurings of the world). Discursive practices and material phenomena do not stand in a relationship of externality to one another; rather, the material and the discursive are mutually implicated in the dynamics of intra-activity. But nor are they reducible to one another. The relationship between the material and the discursive is one of mutual entailment. Neither is articulated/articulate in the absence of the other; matter and meaning are mutually articulated. Neither discursive practices nor material phenomena are ontologically or epistemologically prior. Neither can be explained in terms of the other. Neither has privileged status in determining the other.

Apparatuses of bodily production and the phenomena they produce are material-discursive in nature. Material-discursive practices are specific iterative enactments – agential intra-actions – through which matter is differentially engaged and articulated (in the emergence of boundaries and meanings), reconfiguring the material-discursive field of possibilities in the iterative dynamics of intra-activity that is agency. Intra-actions are causally constraining nondeterministic enactments through which matter-in-the-process-of-becoming is sedimented out and enfolded in further materializations.²⁷

Material conditions matter, not because they „support“ particular discourses that are the actual generative factors in the formation of bodies but rather because *matter comes to matter* through the iterative intra-activity of the world in its becoming. The point is not merely that there are important material factors in addition to discursive ones; rather, the issue is the conjoined material-discursive nature of constraints, condi-

27 The nature of causal intra-actions is discussed further in the next section.

tions, and practices. The fact that material and discursive constraints and exclusions are intertwined points to the limited validity of analyses that attempt to determine individual effects of material or discursive factors.²⁸ Furthermore, the conceptualization of materiality offered by agential realism makes it possible to take account of material constraints and conditions once again without reinscribing traditional empiricist assumptions concerning the transparent or immediate given-ness of the world and without falling into the analytical stalemate that simply calls for a recognition of our mediated access to the world and then rests its case. The ubiquitous pronouncements proclaiming that experience or the material world is „mediated“ have offered precious little guidance about how to proceed. The notion of mediation has for too long stood in the way of a more thoroughgoing accounting of the empirical world. The reconceptualization of materiality offered here makes it possible to take the empirical world seriously once again, but this time with the understanding that the objective referent is phenomena, not the seeming „immediately given-ness“ of the world.

All bodies, not merely „human“ bodies, come to matter through the world's iterative intra-activity – its performativity. This is true not only of the surface or contours of the body but also of the body in the fullness of its physicality, including the very „atoms“ of its being. Bodies are not objects with inherent boundaries and properties; they are material-discursive phenomena. „Human“ bodies are not inherently different from „non-human“ ones. What constitutes the „human“ (and the „nonhuman“) is not a fixed or pregiven notion, but nor is it a free-floating ideality. What is at issue is not some ill-defined process by which human-based linguistic practices (materially supported in some unspecified way) manage to produce substantive bodies/bodily substances but rather a material dynamics of intra-activity: material apparatuses produce material phenomena through specific causal intra-actions, where „material“ is always already material-discursive – *that is what it means to matter*. Theories that focus exclusively on the materialization of „human“ bodies miss the crucial point that the very practices by which the differential boundaries of the „human“ and the „nonhuman“ are drawn are always already implicated in particular materializations. The differential constitution of the „human“ („nonhuman“) is always accompanied by particular exclusions and always open to contestation. This is a result of the nondeterministic causal nature of agential intra-actions, a crucial point that I take up in the next section.

28 See Barad 1998b, 2001a, 2001b, forthcoming for examples.

The nature of production and the production of nature: Agency and causality

What is the nature of causality on this account? What possibilities exist for agency, for intervening in the world's becoming? Where do the issues of responsibility and accountability enter in?

Agential intra-actions are causal enactments. Recall that an agential cut effects a local separability of different „component parts“ of the phenomenon, one of which („the cause“) expresses itself in effecting and marking the other („the effect“). In a scientific context this process is known as a „measurement“. (Indeed, the notion of „measurement“ is nothing more or less than a causal intra-action.)²⁹ Whether it is thought of as a „measurement“, or as part of the universe making itself intelligible to another part in its ongoing differentiating intelligibility and materialization, is a matter of preference.³⁰ Either way, what is important about causal intra-actions is the fact that marks are left on bodies. Objectivity means being accountable to marks on bodies.

This causal structure differs in important respects from the common choices of absolute exteriority and absolute interiority and of determinism and free will. In the case of the geometry of absolute exteriority, the claim that cultural practices produce material bodies starts with the metaphysical presumption of the ontological distinction of the former set from the latter. The inscription model of constructivism is of this kind: culture is figured as an external force acting on passive nature. There is an ambiguity in this model as to whether nature exists in any prediscursive form prior to its marking by culture. If there is such an antecedent entity then its very existence marks the inherent limit of constructivism. In this case, the rhetoric should be softened to more accurately reflect the fact that the force of culture „shapes“ or „inscribes“ nature but does not materially *produce* it. On the other hand, if there is no preexistent nature, then it behooves those who advocate such a theory to explain how it is that culture can materially produce that from which it is allegedly ontologically distinct, namely nature. What is the mechanism of this production? The other usual alternative is also not attractive: the geometry of absolute interiority amounts to a reduction of the effect to its cause, or in this case nature to culture, or matter to language, which amounts to one form or another of idealism.

29 I am grateful to Joe Rouse for putting this point so elegantly (private conversation). Rouse (2002) suggests that *measurement* need not be a term about laboratory operations, that before answering whether or not something is a measurement a prior question must be considered, namely, What constitutes a measurement what?

30 Intelligibility is not a human-based affair. It is a matter of differential articulation and differential responsiveness/engagement. Vicki Kirby (1997) makes a similar point.

Agential separability presents an alternative to these unsatisfactory options.³¹ It postulates a sense of „exteriority within“, one that rejects the previous geometries and opens up a much larger space that is more appropriately thought of as a changing topology.³² More specifically, *agential separability* is a matter of *exteriority within (material-discursive) phenomena*. Hence, no priority is given to either materiality or discursivity.³³ There is no geometrical relation of absolute exteriority between a „causal apparatus“ and a „body effected“, nor an idealistic collapse of the two, but rather an ongoing topological dynamics that enfolds the space-time manifold upon itself, a result of the fact that the apparatuses of bodily production (which are themselves phenomena) are (also) part of the phenomena they produce. Matter plays an active, indeed agential, role in its iterative materialization, but this is not the only reason that the space of agency is much larger than that postulated in many other critical social theories.³⁴ Intra-actions always entail particular exclusions, and exclusions foreclose any possibility of determinism, providing the condition of an open future.³⁵ Therefore, intra-actions are constraining but not determining. That is, intra-activity is neither a matter of strict determinism nor unconstrained freedom. The future is radically open at every turn. This open sense of futurity does not depend on the clash or collision of cultural demands; rather, it is inherent in the nature of intra-activity – even

31 Butler also rejects both of these options, proposing an alternative that she calls the „constitutive outside“. The „constitutive outside“ is an exteriority *within language* – it is the „that which“ to which language is impelled to respond in the repeated attempt to capture the persistent loss or absence of that which cannot be captured. It is this persistent demand for, and inevitable failure of, language to resolve that demand that opens up a space for resignification – a form of agency – within the terms of that reiteration. But the fact that language itself is an enclosure that contains the constitutive outside amounts to an unfortunate reinscription of matter as subservient to the play of language and displays a commitment to an unacceptable anthropocentrism, reducing the possibilities for agency to resignification.

32 Geometry is concerned with shapes and sizes (this is true even of the non-Euclidean varieties, such as geometries built on curved surfaces like spheres rather than on flat planes), whereas topology investigates questions of connectivity and boundaries. Although spatiality is often thought of geometrically, particularly in terms of the characteristics of enclosures (like size and shape), this is only one way of thinking about space. Topological features of manifolds can be extremely important. For example, two points that seem far apart geometrically may, given a particular connectivity of the spatial manifold, actually be proximate to one another (as, e.g., in the case of cosmological objects called „wormholes“).

33 In contrast to Butler’s „constitutive outside“, for example.

34 For example, the space of agency is much larger than that postulated by Butler’s or Louis Althusser’s theories. There is more to agency than the possibilities of linguistic resignification, and the circumvention of deterministic outcome does not require a clash of apparatuses/discursive demands (i.e., overdetermination).

35 This is true at the atomic level as well. Indeed, as Bohr emphasizes, the mutual exclusivity of „position“ and „momentum“ is what makes the notion of causality in quantum physics profoundly different from the determinist sense of causality of classical Newtonian physics.

when apparatuses are primarily reinforcing, agency is not foreclosed. Hence, the notion of intra-actions reformulates the traditional notion of causality and opens up a space, indeed a relatively large space, for material-discursive forms of agency.

A posthumanist formulation of performativity makes evident the importance of taking account of „human“, „nonhuman“, and „cyborgian“ forms of agency (indeed all such material-discursive forms). This is both possible and necessary because agency is a matter of changes in the apparatuses of bodily production, and such changes take place through various intra-actions, some of which remake the boundaries that delineate the differential constitution of the „human“. Holding the category „human“ fixed excludes an entire range of possibilities in advance, eliding important dimensions of the workings of power.

On an agential realist account, agency is cut loose from its traditional humanist orbit. Agency is not aligned with human intentionality or subjectivity. Nor does it merely entail resignification or other specific kinds of moves within a social geometry of antihumanism. Agency is a matter of intra-acting; it is an enactment, not something that someone or something has. Agency cannot be designated as an attribute of „subjects“ or „objects“ (as they do not preexist as such). Agency is not an attribute whatsoever – it is „doing“/„being“ in its intra-activity. Agency is the enactment of iterative changes to particular practices through the dynamics of intra-activity. Agency is about the possibilities and accountability entailed in reconfiguring material-discursive apparatuses of bodily production, including the boundary articulations and exclusions that are marked by those practices in the enactment of a causal structure. Particular possibilities for acting exist at every moment, and these changing possibilities entail a responsibility to intervene in the world’s becoming, to contest and rework what matters and what is excluded from mattering.

Conclusions

Feminist studies, queer studies, science studies, cultural studies, and critical social theory scholars are among those who struggle with the difficulty of coming to terms with the weightiness of the world. On the one hand, there is an expressed desire to recognize and reclaim matter and its kindred reviled Others exiled from the familiar and comforting domains of culture, mind, and history, not simply to altruistically advocate on behalf of the subaltern but in the hopes of finding a way to account for our own finitude. Can we identify the limits and constraints, if not the grounds, of discourse-knowledge in its productivity? But despite its substance, in the end, according to many contemporary attempts at its salvation, it is not matter that reels in the unruliness of infinite possibilities; rather, it is the very existence of finitude that gets defined as matter.

Caught once again looking at mirrors, it is either the face of transcendence or our own image. It is as if there are no alternative ways to conceptualize matter: the only options seem to be the naïveté of empiricism or the same old narcissistic bedtime stories.

I have proposed a posthumanist materialist account of performativity that challenges the positioning of materiality as either a given or a mere effect of human agency. On an agential realist account, materiality is an active factor in processes of materialization. Nature is neither a passive surface awaiting the mark of culture nor the end product of cultural performances. The belief that nature is mute and immutable and that all prospects for significance and change reside in culture is a reinscription of the nature/culture dualism that feminists have actively contested. Nor, similarly, can a human/nonhuman distinction be hardwired into any theory that claims to take account of matter in the fullness of its historicity. Feminist science studies scholars in particular have emphasized that foundational inscriptions of the nature/culture dualism foreclose the understanding of how „nature“ and „culture“ are formed, an understanding that is crucial to both feminist and scientific analyses. They have also emphasized that the notion of „formation“ in no way denies the material reality of either „nature“ or „culture“. Hence, any performative account worth its salt would be ill advised to incorporate such anthropocentric values in its foundations.

A crucial part of the performative account that I have proposed is a rethinking of the notions of discursive practices and material phenomena and the relationship between them. On an agential realist account, discursive practices are not human-based activities but rather specific material (re)configurings of the world through which local determinations of boundaries, properties, and meanings are differentially enacted. And matter is not a fixed essence; rather, matter is substance in its intra-active becoming – not a thing but a doing, a congealing of agency. And performativity is not understood as iterative citationality (Butler) but rather iterative intra-activity.

On an agential realist account of technoscientific practices, the „knower“ does not stand in a relation of absolute externality to the natural world being investigated – there is no such exterior observational point.³⁶ It is therefore not absolute exteriority that is the condition of possibility for objectivity but rather agential separability – exteriority within phenomena.³⁷ „We“ are not outside observers of the world. Nor are we simply located at particular places *in* the world; rather, we are part of the

36 Others have made this point as well, e.g., Haraway 1991; Kirby 1997; Rouse 2002; and Bohr.

37 The notion of agential separability, which is predicated on the agential realist notion of intra-actions, has far-reaching consequences. Indeed, it can be shown to play a critical role in the resolution of the „measurement problem“ and other long-standing problems in quantum theory. See Barad forthcoming.

world in its ongoing intra-activity. This is a point Niels Bohr tried to get at in his insistence that our epistemology must take account of the fact that we are a part of that nature we seek to understand. Unfortunately, however, he cuts short important posthumanist implications of this insight in his ultimately humanist understanding of the „we“. Vicki Kirby eloquently articulates this important posthumanist point:

„I'm trying to complicate the locatability of human identity as a here and now, an enclosed and finished product, a causal force upon Nature. Or even [...] as something within Nature. I don't want the human to be in Nature, as if Nature is a container. Identity is inherently unstable, differentiated, dispersed, and yet strangely coherent. If I say ‚this is Nature itself‘, an expression that usually denotes a prescriptive essentialism and that's why we avoid it, I've actually animated this ‚itself‘ and even suggested that ‚thinking‘ isn't the other of nature. Nature performs itself differently.“ (Vicki Kirby, private communication, 2002).³⁸

The particular configuration that an apparatus takes is not an arbitrary construction of „our“ choosing; nor is it the result of causally deterministic power structures. „Humans“ do not simply assemble different apparatuses for satisfying particular knowledge projects but are themselves specific local parts of the world's ongoing reconfiguring. To the degree that laboratory manipulations, observational interventions, concepts, or other human practices have a role to play it is as part of the material configuration of the world in its intra-active becoming. „Humans“ are part of the world-body space in its dynamic structuration.

There is an important sense in which practices of knowing cannot be fully claimed as human practices, not simply because we use nonhuman elements in our practices but because knowing is a matter of part of the world making itself intelligible to another part. Practices of knowing and being are not isolatable, but rather they are mutually implicated. We do not obtain knowledge by standing outside of the world; we know because „we“ are *of* the world. We are part of the world in its differential becoming. The separation of epistemology from ontology is a reverberation of a metaphysics that assumes an inherent difference between human and nonhuman, subject and object, mind and body, matter and discourse. *Onto-epistem-ology* – the study of practices of knowing in being – is probably a better way to think about the kind of understandings that are needed to come to terms with how specific intra-actions matter.

38 Kirby's sustained interrogation of the tenacious nature/culture binary is unparalleled. See Kirby 1997 for a remarkable „materialist“ (my description) reading of Derridean theory.