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 techno-scientific and other practices that takes feminist, antiracist, 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 essay 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 techno-scientific ones.

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, *Foucault*

"Words and things" is the entirely serious title of a problem.

—Michel Foucault, *The Archaeology of Knowledge*

Representationalism separates the world into the ontologically disjointed 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 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 theorization 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 and 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 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,

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]

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 theorization 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.

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 of "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 space-time 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. 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