UC Berkeley
UC Berkeley Electronic Theses and Dissertations

**Title**

Feminist Materials: quantum physics and critical writing practices for new material feminism

**Permalink**

https://escholarship.org/uc/item/8589h285

**Author**

Moran, Stacey

**Publication Date**

2017

Peer reviewed|Thesis/dissertation

eScholarship.org Powered by the California Digital Library
University of California

# Feminist Materials: quantum physics and critical writing practices for new material feminism

By

Stacey Colleen Moran

A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

in

Rhetoric

in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor David W. Bates, Chair
Associate Professor Ramona Naddaff
Professor Charis Thompson
Associate Professor Phillip Thurtle

Summer 2017

Copyright © 2017 by Stacey Colleen Moran
All rights reserved

Abstract

Feminist Materials: quantum physics and critical writing practices for new material feminism

by

Stacey Colleen Moran

Doctor of Philosophy in Rhetoric

University of California, Berkeley

Professor David Bates, Chair

After decades of being driven by social constructivism, a sea change is occurring in feminism. Feminists have declared that, "language has been given too much power." This phrase has become a mantra of feminism as it tries to "bring the material back in." This dissertation examines the emergence of new material feminism and its attempt to revive materiality by "turning" toward science. One of the many questions that motivates this dissertation is how has this "material turn" in feminism come about? And why now? Why is it that after years of critiquing the gendered practices of science are feminists suddenly drawing on the sciences, and for what purpose? One of the central motivations for this turn toward science has to do with a more general tendency in the theoretical humanities and social sciences to move away from textual practices. Many theorists argue that language-focused criticism has led to a privileging of "the social" and its human-centered practices at the expense of the material world studied by the sciences. This privileging has created a gulf between humanistic and scientific research. Part of their project, then, is to rebuild connections between the sciences and humanities.

For new material feminists in particular, quantum physics has become a crucial touchstone. Part of this turn is motivated by the work of theoretical physicist and feminist, Karen Barad. One of the challenges of this dissertation is to try to figure out how quantum physics is being used by Barad and other feminists: is it merely metaphorical? Or does it function as a general analytic for a new kind of feminism? And if so, what's at stake in merging the concepts and methodologies of physics with feminist theory and practice? Are these feminists calling for a new kind of scientism, or are they calling for something far more subtle, akin to the study of experimental practices in science and technology studies? And furthermore, are these feminists sacrificing any of the hard-fought victories from earlier feminisms? Perhaps most crucially, when feminists champion quantum physics, what aspects of this challenging work are they using, and what are they leaving out? How do language and meaning, for example, figure in this new quantum feminism? Are they made irrelevant in order to embrace the physics? In essence, what this dissertation concerns itself with is how quantum physics has come to have such a hold on the imagination of feminists.

My argument in this dissertation is essentially that new material feminists have a very selective reading of quantum physics. I will show how they valorize the notions of entanglement and

diffraction, which have come to be synonymous with connectivity, inclusivity, and becoming. For feminists, this has opened up a whole new intellectual genealogy, which links quantum physics to theorists such as Gilles Deleuze, Henri Bergson, Bruno Latour, and Alfred North Whitehead. While these are productive "inclusions" that get feminism out of language-centered modes of criticism, they are very often guilty of a cursory reading of the science of entanglement that elides the much more difficult and controversial aspects of the concept. In particular, I demonstrate how measurement and decoherence are unresolved problems for quantum physics, and thus render entanglement a much more complicated set of practices than new material feminists make them out to be. What I endeavor to do then, is to bring decoherence into sharper focus for new materialism. In particular, I want to explore what a new material feminist writing practice that is attentive to the decoherent aspects of entanglement would look like.

To do so, this dissertation has four chapters that take up different aspects of the feminist appropriation of quantum physics. Chapter 1 evaluates new material feminism's great faith in the work of Barad to "save feminism" from the effects of the linguistic turn. The chapter begins by outlining her theory of agential of realism, which contributes to both science and feminism. Barad critiques current social theories that she argues are grounded in Newtonian principles and harbor three basic assumptions that severely limit our ability to think through the problems we face today: individualism, humanism, and representationalism. Expanding on Donna Haraway's figuration of "diffraction" as a new optics, Barad develops a new critical method of diffraction, one that utilizes concepts from quantum mechanics to resituate feminist theory as specifically material. In the last several years, Barad's diffractive method has gained traction in many disciplines, including education, anthropology, comparative literature, film and new media studies, sociology, and theology. Exploring the ways in which diffraction is taken up as a method, I find that four basic tendencies emerge: diffraction as a metaphorical framing for thought, diffraction as a reading practice that produces real effects in the world, diffraction as affirmative critique, and diffraction as an ambiguous "between" space that challenges boundaries. Barad's theory of agential realism is grounded in quantum physics, and yet I find that diffraction is deployed in terms of classical physics. This refusal to notice the difference between classical and quantum diffraction, I argue, keeps new material feminism tethered to the very Newtonian assumptions they are trying to avoid. New material feminists blame the linguistic turn for the development of "anti-biologism" in feminism, and thus "reject" language from their material concerns. I argue however, that new material feminists must not turn away from language, but rather, engage with it more "real-istically" in order to develop non-representational modes for feminist theory that could align more effectively with Barad's quantum insights.

Given that the prospect of a specifically "quantum" method of diffraction has yet to be explored, Chapter 2 provides a preliminary sketch of what this sort of method might look like. Nobel prize winning theoretical physicist Richard Feynman declares that classical and quantum physics are "impossibly different," so in order to unpack those differences, I open the chapter by examining the science. First, I present experiments from the early twentieth century that led to two important discoveries in quantum mechanics: particle-wave duality and electron spin. These experiments serve to demonstrate the relevant differences between classical and quantum diffraction, as well as introduce useful quantum concepts, such as interference, superposition, complementarity, inseparability and decoherence. Although it is assumed in new material

feminist discourse that "exclusions matter," very little attention is paid to the precise nature of those exclusions, and none is paid to specifically "quantum" exclusions. On the contrary, diffractive readings often privilege the quantum term "entanglement," but deploy it in terms of a wave metaphor from classical diffraction that implies connectedness and inclusivity. In other words, I argue, despite the claim that "exclusions matter," the diffractive method has largely excluded exclusions from its practice.

Therefore, and second, I bring exclusions back into the diffractive method through an explanation of the mysterious Measurement Problem in quantum physics. Although physicists don't agree on how to solve this so-called problem, they (mostly) agree that measurement interference is crucial to the transition, or "drop," from indeterminacy to a determined state. This is called "decoherence." The universe is not "everywhere connected," or simply and universally "entangled;" rather, "measurements matter" because decoherence is the crucial transition from indeterminacy to determined state. Applied to the quantum method of diffraction, then, the privileging of entities that only "combine and overlap" is necessarily insufficient; any quantum mode of diffraction, I argue, must also account for the exclusionary practices that operate to produce representations, intelligibility, and knowledge. New material feminism can account for its exclusion for decoherence, and thereby put it to use. I conclude the chapter by asserting that a quantum diffractive method cannot simply be an "affirmative" reading practice that interprets texts; rather, it is a genealogical practice that traces out the invisible representational practices involved in producing intelligibility which ground a given textual interpretation.

Moving beyond the interpretive strategies of diffraction that visualize ever more entangled relations, Chapter 3 focuses in on decoherence as an exclusionary practice that matters for new material feminism. New material feminists are keen to "undo dualisms," especially the lingering one between language and reality, but their "de-constructive" attempts, I argue, maintain the ontological separation of language and reality. Language, I suggest, is a problematic field that requires a creative response. Therefore, following the critical assessment of new material feminist diffractive methods in Chapter 1, and the demand to incorporate decoherence into a proposed quantum diffraction method in Chapter 2, I am led in Chapter 3 to map some new conceptual territory. I turn to the works of Gilles Deleuze and Félix Guattari in order to render visible the surprising relations between their work on rhizomatics and the measurement apparatus in quantum physics. There is a conceptual parallel, I contend, between two separate occlusions in these two discourses. First, rhizomatics was conceived as a general analytic, and consequently left out the specific guidelines on writing. Although numerous scholars remark on Deleuze and Guattari's "preoccupation with the book" in *A Thousand Plateaus*, writing is utterly neglected in the commentary. Second, the diffractive method has privileged the notion of connection in quantum entanglement, and consequently, has left out decoherence from diffraction. This chapter reclaims both omissions—"the book" and "decoherence"—and draws them together. Following on what Deleuze and Guattari have to say about diagrammatic writing as an alternative to the literary text, I theorize an experimental and non-representational practice of writing for diffraction that I call "decoherent writing."

Chapter 3 shows how writing was excluded from rhizomatics and decoherence was excluded from the diffractive method. Carrying this idea of constitutive exclusions over into Chapter 4, I offer a genealogical investigation of particular exclusions that produce diffraction as a "new

optics" for new material feminism. In other words, I use the idea that writing practices make necessary exclusions to understand the conditions of possibility for new material feminism to exist as a material writing practice. Their "new diffractive optics" involves the dismantling of negative critique in favor of an affirmative form of critique. This new affirmative criticality has become a hallmark of new material feminism. In this chapter I demonstrate how an affirmative reading practice can only exist on the condition that language and poststructuralism are excluded. I pay special attention to the very specific rhetorical techniques that make this constitutive exclusion possible. What is and must be excluded are the invisible conditions of possibility for these new materialist modes of viewing. In the end, I argue that new material feminism excludes exclusions in order to promote affirmation. Engaging with the quantum concept of decoherence offers a way to highlight and account for the constitutive exclusions of feminist writing practices.

## Table of Contents

## Acknowledgements

I would like to extend thanks to my dissertation committee for their dedicated help and support: David Bates, Charis Thompson, Ramona Naddaff, and Phillip Thurtle. Work on this dissertation was interrupted by profound life changes, and I offer heartfelt thanks to all of the people who offered support during my hiatus, and especially to those who never doubted that I would finish. I am grateful to Daniel Boyarin's willingness to set me back on the right path.

I am especially grateful to my parents, who taught me to be curious about the world and encouraged my timid heart to follow my passions.

Cherished friends have been an indispensable part of my thinking and writing process. My first really important insights about new material feminism came from Kathrin Thiele, Birgit Mara Kaiser, and Iris Van der Tuin. My overwhelming appreciation goes to them, as their invaluable contributions have impacted my development as a scholar. I feel very fortunate indeed to have benefited from conversations with many Deleuze Studies colleagues, but especially Patricia Pisters, Gregg Lambert, Gregory Flaxman, Frida Beckman, Joshua Ramey, Ron Bogue, and Ian Buchanan. I thank as well the many graduate students from UC Berkeley who shared their intellect and friendship with me, but most especially to Mona Bower, James Harker, Jennifer Gurley, and Meredith Hoy, who offered unflagging patience and moral support throughout my double journey through graduate school and motherhood. To my mind at least, this guarantees friendship for life.

I would also like to thank everyone in the Comparative History of Ideas program at the University of Washington (CHID). CHID provided me with many years of funding and friendship, and I have grown to think of the faculty, staff, and students there as family. The CHID philosophy, its strong pedagogical values, rigorous engagements with ideas in the world, and the steadfastness with which they pursue issues of social justice are the foundation on which I have grown up. These values are engrained in me, and I will carry them with me wherever I go. CHID boasts a strong network of engaged scholars whose ideas contributed to my own transdisciplinary way of thinking. Special thanks to Amy Peloff, Naraelle Hohensee, Terry Schenold, Christina Wygant, Nancy White, Tamara Meyers, Erin Clowes, Keith Harris, and Nick Barr Clingan. It was truly my pleasure to be a part of CHID's indelible effort to create an intense and engaged community of learning.

My heartfelt thanks goes out to John Toews who has been a mentor to me at every stage of my education. John's patient tutelage as my senior thesis advisor gave me the confidence to apply to Berkeley's Rhetoric Department. Upon my return to the University of Washington as a graduate student, he immediately offered me a teaching position to ensure that I could support my family while finishing my dissertation. I remain in awe of John and his lovely wife Eleanor; together they taught me the values of humility, kindness, and generosity in thinking, teaching, and living. His hope that his influence will be reflected in my pedagogy and professionalism for the rest of my career.

All attempts to fully capture the depths of this sentiment will necessarily fall short, but

I would like to express my deepest gratitude to Phillip Thurtle, whose friendship and generous support continues to be nothing short of remarkable. I hold enduring appreciation for his encouragement and astute and helpful feedback on this dissertation. Phillip initiated my first foray into science and technology studies; with the Interdisciplinary Educator Award, I was privileged to serve as a teaching assistant for his Biofutures course. I am forever indebted to his intellectual and pedagogical influence. His devotion to students, his tenacity for producing authentic encounters, and his wonderfully creative ways of thinking and being will inspire me always.

Finally, I dedicate this dissertation to Adam and our daughters, Fiona and Ivy, without whose immeasurable love this could not have been written. I am grateful for Adam's impassioned belief in my work, his willingness to listen to me talk through every argument, and to read every draft. He always believed in me, even when I lost my way. And to the girls, what joy it gives me to finally answer with a resounding, "Yes!" the oft-repeated question: "Mom, are you done yet?"

# Introduction

1.

After decades of being driven by linguistic and social constructivism, a sea change is occurring in feminism. Many feminists claim that, "language has been given too much power." This declaration against the privileging of language is what motivates the new material feminist project to "bring the material back in." This dissertation examines the emergence of new material feminism and its attempt to revive materiality by "turning" toward science, and quantum physics in particular. One of the many questions that motivates this dissertation is how has this "material turn" in feminism come about? And why now? Why is it that after years of critiquing the gendered practices of science are many feminists suddenly drawing on the sciences, and for what purpose?[1]

One of the central motivations for the current turn toward science has to do with a more general tendency in the theoretical humanities and social sciences to move away from textual practices. Many humanities scholars argue that language-focused criticism has led to a privileging of "the social" and its human-centered practices at the expense of the material world studied by the sciences.[2] This privileging, they argue, has created a gulf between humanistic and scientific research. Part of their project, then, is to rebuild connections between the sciences and humanities.[3] Alfred North Whitehead's argument against the "bifurcation of nature" into what is real and what is a mere appearance has become a rallying cry for materialist and speculative research in the last decade.[4]

Of course, the turn to science in feminism is anything but "new." For decades, feminist scholarship has engaged with science in order to emphasize not only how women are underrepresented in the sciences,[5] but also how sexism and other cultural biases affect the production of scientific theories.[6] Both feminist Science and Technology Studies (STS) and the

---

[1] For example, Evelyn Fox Keller, *Reflections on Gender and Science* (Ithaca: Yale University Press, 1995). Sandra Harding *Whose Science? Whose Knowledge? Thinking from Women's Lives* (Ithaca: Cornell University Press, 1991). Nancy Tuana, *Feminism and science* (Indiana University Press, 1989).

[2] See *The Speculative Turn: Continental Materialism and Realism,* Edited by Levi Bryant, Nick Srnicek, and Graham Harman, (Victoria: Re.press, 2011).

[3] This is a general tendency that is not exclusive to feminism or continental philosophy. See Steven Pinker, "Science is Not Your Enemy" in *New Republic*. August 6, 2013; Gary Gutting, "Science's Humanities Gap." *New York Times*. September 18, 2013; Walter Isaacson, "The Intersection of the Humanities and the Sciences," Jefferson Lecture in the Humanities. National Endowment for the Humanities (2014).

[4] Alfred North Whitehead, *The Concept of Nature*. (Memphis: General, 2010); Isabelle Stengers, "A Constructivist Reading of Process and Reality," *Theory, Culture & Society* 25.4 (2008): 91-110; Bruno Latour, *What Is the Style of Matters of Concern?: Two Lectures in Empirical Philosophy* (Assen: Koninklijke Van Gorcum, 2008).

[5] Ruth Bleier, *Feminist Approaches to Science. The Athene Series*. (Pergamon Press, Maxwell House, Fairview Park, Elmsford, NY 10523, 1986); Evelyn Fox Keller, *Reflections on Gender and Science*, Edited by Sandra G. Harding, *Feminism and methodology: Social science issues* (Indiana University Press, 1987); Donna Jeanne Haraway, *Primate visions: Gender, race, and nature in the world of modern science* (London: Psychology Press, 1989).

[6] For example, see Annette Baier, *Postures of the Mind: Essays on Mind and Morals* (Minneapolis: University of Minnesota Press,1985); Susan Bordo, "The Cartesian Masculinization of Thought." *Signs* 11 (Spring 1986): 439-456. Judith Butler. *Gender trouble: Feminism and the subversion of identity*, (New York: Routledge, 1990), and *Bodies that matter: On the discursive limits of sex* (New York: Routledge, 1993); Lorraine Code. *What can she know? Feminist theory and the construction of knowledge*. Ithaca: Cornell University Press, 1991; Patricia Hill Collins, *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment* (New York:

Sociology of Scientific Knowledge (SSK) from the late 1970s and through the 1990s have argued against the "neutral" basis of knowledge production in the sciences,[7] questioned the nature of truth and objectivity,[8] and provided a much needed corrective to "the infallibility of science and the transcendence of scientific facts."[9] For example, Lynn Hankinson Nelson develops the notion that science is communal, thinking about the ways in which certified knowledge is accumulated through collaboration.[10] Helen Longino shows the ways in which our values are always operating in scientific theories and proofs, and she develops a "contextual empiricism" whereby science is viewed as a social enterprise, and diverse perspectives support objectivity.[11]

There is nothing fundamentally "new" about feminist materialism either. Feminist epistemologists and standpoint theorists such as Sandra Harding, Nancy Harstock, and Donna Haraway among others developed the notion of the knower who is situated physically, politically, economically, and socially in relation to the production of knowledge in science.[12] This situated knower in feminist epistemology is very often tied to Marxist notions of dialectical materialism and the development of the collective workers' consciousness in relation to economic modes of production. Feminist materialism pays close attention to the location of a particular knower and the ground of its privilege.

This materialist tradition is also tied to the phenomenology of sexed and gendered bodies that goes back to Simone de Beauvoir's *The Second Sex*, and also to the work of Sandra Bartky and Iris Marion Young in the 1970s.[13] In *Throwing Like a Girl*, Young explores bodily

---

Routledge, 1990); Harding, *The science question in feminism* (Cornell University Press, 1986); Harding, *Whose Science? Whose Knowledge?: Thinking from Women's Lives* (Ithaca: Cornell University Press, 1991); Helen E. Longino, *Science as social knowledge: Values and objectivity in scientific inquiry* (Princeton: Princeton University Press, 1990); Genevieve Lloyd, *The Man of Reason: "male" and "female" in Western philosophy* (Methuen & Co. Ltd. 1986); Alison Wylie, "Feminist theories of social power: Some implications for a processual archaeology," *Norwegian archaeological review* 25.1 (1992): 51-68.

[7] For example, see Lynn Hankinson Nelson, "A Question of Evidence," *Hypatia* 8.2. (1993): 172-189

[8] For example, see Hankinson Nelson, "Epistemological communities," *Feminist epistemologies*, Edited by Linda Alcoff and Elizabeth Potter (London: Routledge, 1993): 121-160. Longino, *Science as social knowledge*; Harding, *The science question in feminism* (Ithaca: Cornell University Press, 1986); Harding, *Is science multicultural?: Postcolonialisms, feminisms, and epistemologies* (Bloomington: Indiana University Press, 1998); Harding *Whose Science? Whose Knowledge?*

[9] Charis Thompson, *Making Parents: The ontological choreography of reproductive technologies* (MIT Press, 2005), 51. Also see Donna Haraway. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies*, Vol 14 (Autumn 1988): 575-599. Annemarie Mol and John Law, *Complexities: Social Studies of Knowledge Practices. Science & Cultural Theory* (Durham, NC: Duke University Press, 2002).
Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone, 2010).

[10] Hankinson Nelson in Alcoff and Potter, "*Feminist epistemologies*" (London: Routledge, 1993).

[11] Longino, *Science as social knowledge.*

[12] Harding, *The science question in feminism*; Whose Science?; and *Is science multicultural?* Nancy Hartsock, *The Feminist Standpoint Revisited and Other Essays* (Boulder: Westview Press, 1998); Dorothy E. Smith, *The Conceptual Practices of Power a Feminist Sociology of Knowledge* (Toronto: University of Toronto Press, 1990); Haraway, *Primate Visions*; also Jane Flax, "Political philosophy and the patriarchal unconscious: A psychoanalytic perspective on epistemology and metaphysics," in Sandra Harding and Merrill B. Hintikka, *Discovering Reality*. (D. Reidel Publishing Company, 1983), 245-281.

[13] Simone de Beauvoir, *The Second Sex*. *Trans. HM Parshley.* Reprint. (New York: Vintage Books, 1952); Iris Marion Young, "Throwing like a girl: A Phenomenology of Feminine Body and Comportment Motility and Spatiality," *Human Studies* Vol. 3, No. 2 (April 1980): 137-156; Sandra Lee Bartky, "Toward a phenomenology of feminist consciousness," *Social theory and Practice*, (Fall 1975).

comportment as a situation of society that often inhibits the bodies of women. Linda Alcoff's notion of "visible identities" shows how race, sex, and other visible bodily features gain significance that "becomes a part of perceptual experience, feels natural and becomes unconscious after long use."[14] Toril Moi suggests that it is the lived body, rather than sex or gender, that anchors sexed subjectivity.[15] Although these empirical approaches were criticized by poststructuralists for positing the body as pure ground of experience, the phenomenological writers attended to situate bodies and the lived experience of those individual bodies, all the while complicating the real relations between the natural and social aspects; they did this by means of what Alcoff calls "cross-indexing."[16] Knowers and bodies in these traditions are gendered, but as always particular and concrete, and historically and culturally specific.

In this regard, the "new" material feminism diverges from this concern for the lived experience of real women, which appears to be almost completely absent from the discourse. Although new material feminists claim to be concerned with "the particular and concrete problems of the 21st century," their material examples look more like stock market crashes and natural disasters,[17] and their mode of intervention tends toward the abstract: "In short, what we aim at…is the articulation of a significant discourse for critical and creative research, one that is of relevance for all those who are interested in learning to think."[18] Inspired by materialist philosophies of process and change, such as Gilles Deleuze and Henri Bergson, new material feminists attach profound importance to the necessity of creating new concepts for thinking ourselves out of material problems like climate change.[19]

So neither feminist science studies nor feminist materialism is new. However, the perception of new material feminists, as Myra Hird points out in *Sex, Gender, and Science*, is that feminist theory has explored cultural constructions of materiality but only in the sense of what she calls the *"culture of matter."* All of these feminist inquiries of the past, she notes, "emphasize the social, political, and economic features of women in science," rather than the material objects of science.[20] New material feminists consider this pervasive "culture of matter" to be precisely the problem; in other words, despite their claims to find deep interdependence between culture and matter, culture continues to be privileged. Judith Butler has to come to stand in for this cultural mattering of bodies. Susan Bordo argues that "Butler's world is one in which language swallows everything up."[21] New materialist feminists thus turn to science not to find "pure matter," but rather, to affirm the very deep interdependence between culture and matter that past generations have not yet achieved. They do so by addressing the relations between

---

[14] Linda Alcoff, *Visible identities: Race, gender, and the self* (New York: Oxford University Press, 2006).
[15] Toril Moi, *What is a Woman? And other essays* (Oxford: Oxford University Press, 1999).
[16] Alcoff, *Visible identities,* 107.
[17] For example, Nancy Tuana, "Viscous porosity: witnessing Katrina," in Susan Hekman and Stacy Alaimo, *Material feminisms*, 2008: 188-213.
[18] European Cooperation in Science and Technology (COST). http://www.cost.eu/COST_Actions/isch/IS1307 "Memorandum of Understanding," 2013.
[19] For example, see Birgit Mara Kaiser and Kathrin Thiele, "Diffraction: Onto-epistemology, Quantum Physics and the Critical Humanities." *Parallax* 20.3 (2014): 165-167; Vera Bühlmann, Felicity Colman, and Iris van der Tuin, "Introduction to New Materialist Genealogies: New Materialisms, Novel Mentalities, Quantum Literacy," *Minnesota Review* 88.1 (2018): 47-58.
[20] Myra J. Hird, "Feminist Matters: New Materialist Considerations of Sexual Difference," *Feminist Theory* 5.2 (2004): 4.
[21] Susan Bordo, *Unbearable Weight: Feminism, Western Culture, and the Body* (Berkeley: University of California Press: 1993), 291.

culture and matter not, as feminist phenomenologists, through the experience of human bodies, but rather, through the operations of the physical phenomena of science. An important distinction between earlier feminist STS and SSK studies and new material feminism is the nonhuman or posthuman emphasis on bodies more broadly construed. Rather than gendered human bodies, new material feminists look to "bodies" such as photons, wave packets, and the which-paths of diffracting electrons for their insights. Arguably, many of these inquires, as I will argue in Chapter 1, are merely metaphorical accounts of scientific phenomena, and thus themselves lean toward the "culture of matter," remaining unable to construe culture and matter as interdependent.

There is an important sense in which the emphasis on the interdependency between nature and culture is not new either. Feminist STS scholars are interested in the various means by which scientific facts become stabilized and aim to study precisely this contingency of facts, acknowledging that "the facts" could have been otherwise.[22] In other words, while scientific knowledge is indeed constructed, this does not mean that "reality" must therefore be discounted. The destabilization of science and its facts need not fall prey to reductive social constructionism; rather, contemporary STS scholars, Charis Thompson argues, are now tasked with providing political and ethical means for navigating this "science in flux." In concert with Latour's Actor-Network Theory (ANT), Thompson's concept of "promiscuous realism" attributes reality to many different kinds of things and agents, a notion not unrelated to what has been called the "democracy of objects," whereby all objects equally exist but don't exist equally.[23]

In general, feminist materialist associations with science encompass a wide array of disciplines, especially philosophy, but also biology, history and philosophy of biology, sociology and science studies, as well as psychology and psychoanalysis. Although it is important not to lump them all together and say that just because they are "feminists" who engage with science that they therefore all agree, nevertheless there are some important similarities. First, many feminist STS scholars were educated in a scientific field. Second, Thompson finds that among much of the recent feminist STS and SSK work there is what she calls "epistemologies based on mobility."[24] Thompson refers to Rosi Braidotti, Annemarie Mol, Angela Davis, and Elspeth Probyn, but there are many other examples where dynamic processes of various kinds are privileged. Feminists such as Anne Fausto-Sterling argues that dynamical systems theory helps us to think through complexities of gene expression. Her work in systems biology and developmental psychology demonstrates how complex systems of interacting factors contribute to the expression of a trait. Dynamic relations among multiple elements are also key for Nancy Chodorow's psychoanalytic anthropology, which she calls a "multiplex web."[25] Arguing that the gut doesn't simply contribute to, but is actually "an organ of the mind," Elizabeth Wilson's work on the neurological body insists that the dynamism of biology can contribute to our thinking in feminist theory.[26] Thompson's own study of assisted reproductive technology clinics employs the notion of "ontological choreography," which refers to the "deftly balanced coming together of things that are generally considered parts of different ontological orders." For example, the

[22] Thompson, *Making parents, 33.*
[23] Levi R. Bryant, *The Democracy of Objects* (Open Humanities pres, 2011); Graham Harman, *Prince of Networks: Bruno Latour and Metaphysics* (Re. press, 2010).
[24] Thompson cites Rosi Braidotti's "nomadic subject" (1994), Angela Davis' "blues epistemology" (1999), Annemarie Mol's "ambulating idiom" (2002) and Elspeth Probyn's "metaphor of departure" (1995), 49.
[25] Nancy Chodorow, *Feminism and Psychoanalytic Theory* (New Haven: Yale University Press, 1989).
[26] Elizabeth A. Wilson, *Psychosomatic: Feminism and the Neurological Body* (Durham: Duke University Press, 2004).

many aspects involved in "making parents" includes the interplay, or "dance," of technical, scientific, kinship, gender, emotional, legal, political, and financial aspects, all of which Thompson considers to be ontologically real.[27] There is an important sense in which new material feminism has an unacknowledged debt to the dynamical systems work of earlier feminist materialisms. And while I will not examine the nuances of this debt here, it is perhaps most forcefully felt in how the "entanglement" and "emergence" of the quantum realm are the backbone of work in new material feminism.

A major catalyst in this turn to quantum physics is the work of theoretical physicist and feminist, Karen Barad. Barad is heavily indebted to the work of Donna Haraway. As she explores "the entanglement of matter and meaning" in *Meeting the Universe Halfway,* Barad often seems merely to reiterate Haraway's cultural studies approach to science in a new quantum vocabulary: Haraway's diffractive method is adopted and performed throughout; interdisciplinarity and pluralism are privileged in terms of "diffracted" disciplines; a critique of objectivity or "the view from nowhere" is approached as "exteriority within;" the central focus is to overturn binaries, especially the nature/culture divide understood here as "matter and meaning;" situated knowledges find their place in the precise experimental practices in quantum physics; the insistence that matter is an active agent in the world such that boundaries (e.g., between subject/object and material/discursive) are ambiguous finds quantum expression in Barad's neologism, "intra-action."

In a certain way, however, Barad's work might be viewed not as a re-articulation of Haraway's in a different vocabulary, but rather, as a labor of love. Despite the award-winning success of her work today, reviewers of Haraway's first book, *Primate Visions,* accused it of being "methodologically vague,"[28] "full of vapid, French-intellectual prose," "lacking an editorial hand altogether,"[29] and providing "no lucid history of anthropology or primatology."[30] Barad has received very similar critiques.[31] This may be due to the tendency for analytical philosophy of science typically to undertake either an anti-realist or a realist strategy. Attempting to denaturalize this binary division as well, both Haraway and Barad engage instead with Continental philosophy, which is more attentive to the role of language in thought. Feminist science studies scholars also tend to hail from the analytic tradition,[32] and have difficulty following what they see as the convoluted, vague, or confusing elements of Continental writers. Barad notes that precisely where STS scholar Trevor Pinch accuses her work of losing clarity is the point where she seriously engages with Derrida, a discourse with which he is obviously unfamiliar.[33] Joseph Rouse argues that this is a common problem in STS; he encourages these interdisciplinary forays into the Continental tradition precisely because they are able to attend to

---

[27] Thompson, *Making parents*, 8.

[28] Gail M. Hamner, "The Work of Love: Feminist Politics and the Injunction to Love," *Opting for the Margins: Postmodernity and Liberation in Christian Theology* 9, 2003.

[29] Matt Cartmill, "Book Review: Primate Visions: gender race and nature in the world of modern science," *International Journal of Primatology*, Vol. 12, No. 1, 1991.

[30] Susan Cachel, "Partisan primatology. Review of *Primate Visions: gender race and nature in the world of modern science*," *American Journal of Primatology* 22: (1990): 139-142.

[31] Silvan S. Schweber, "Karen Barad. Meeting the Universe Halfway: Quantum Physics and the Entanglement of Meaning and Matter," *Isis: Journal of History of Science in Society* 99.4 (2008): 879-82; Trevor Pinch, "Karen Barad, quantum mechanics, and the paradox of quantum inclusivity," *Social Studies of Science* 41(3), 2011: 431-441.

[32] For example, Lynn Hankinson Nelson, Alison Wylie, Louise Antony, and Charlotte Witt, etc.

[33] Barad, Karen. "Erasers and erasures: Pinch's unfortunate 'uncertainty principle'" *Social Studies of Science* 41(3) April, 2011: 443-454.

the blind spots that remain in an STS dependent upon the analytical tradition.[34] Barad takes up this challenge, and in a certain sense, carries forward Haraway's project.

One of the challenges of this dissertation is to try to figure out how quantum physics is being used by Barad and new material feminists. Unlike Barad and the feminist STS scholars of the previous decades, new material feminists engaging with "quantum feminism" are not trained in scientific fields. On the contrary, they are humanities scholars trained in literary fields with a very limited knowledge of science, perhaps equipped with only popular images of scientific entities and theories. As such, another crucial difference between new material feminism and feminist STS and SSK is that the former are not composed of scientists, and they do very little "empirical work"; rather, they are, by and large, humanities scholars whose training comes by way of French philosophy.[35] Whereas the feminist STS and SSK philosophers tend to rely on analytic philosophy (e.g., the Quinean naturalism developed by Lynn Hankinson Nelson and Louise Antony),[36] new materialist feminism is largely one that is indebted to Gilles Deleuze, Jacques Derrida, Michel Foucault, and Continental philosophy more generally. And in this context, the well-rehearsed accusations that this theoretical work is formal, esoteric, elitist, and apolitical has led these feminists to insist that "there is something real that drives the invention of this novel kind of abstract vocabulary."[37] This quotation is taken from the COST Action grant memorandum, "New Materialism: Networking European Scholarship on 'How Matter Comes to Matter.'" One goal of this state funded organization is to unify the currently dispersed EU scholarship, specifically modeled after American scholars who currently "dominate the field" by "canoniz[ing] the new materialism in anthologies."[38]

What the European new material feminists consider to be "real" here may indeed be the "matter" that has been forgotten in the wake of Kant's Copernican Revolution; but I want to suggest also that the need for the humanities to work across divides in the university is principally taken up as a strategy to fight back against the emergent neoliberal university. The new material feminist attempt to bridge the gap between science and the humanities, I would argue then, is an attempt to make the humanities *matter*.[39] Judith Butler points out that in this "struggle against oblivion" that the humanities finds itself in, is in part due to its being devalued by neoliberal forms of assessment, and thus scholars feel the constant threat of loss due to the idea that they are "worth less" than the hard sciences or even the social sciences. The urge to

---

[34] See Joseph Rouse, "Understanding Scientific Practices: Cultural Studies of Science as a Philosophical Program" *Division I Faculty Publications. Paper 23,* 1999.

[35] See François Cusset, *French Theory: How Foucault, Derrida, Deleuze, & Co. Transformed the Intellectual Life of the United States*, Translated by Jeff Fort (Minneapolis: University of Minnesota, 2008).

[36] See Hankinson Nelson, *Who Knows: From Quine to a Feminist Empiricism* (Philadelphia: Temple University Press 2010); Louise M. Antony and Charlotte Witt, *A mind of one's own: feminist essays on reason and objectivity*. (Boulder: Westview Press, 2002).

[37] European Cooperation in Science and Technology (COST). http://www.cost.eu/COST_Actions/isch/IS1307

[38] Co-Chairs of the COST New Materialism are Iris Van der Tuin and Felicity Colman. Also see, Van der Tuin, "On The Threshold of New Materialist Studies" *FORUM: University of Edinburgh Postgraduate Journal of Culture & the Arts*. No. 19, 2014.

[39] On the rhetoric of crisis in the humanities, see Michael Bérubé and Cary Nelson, *Higher Education Under Fire: Politics, Economics, and the Crisis of the Humanities* (London: Psychology Press, 1995); Gordon Hunter, Feisal G. Mohamed, *A New Deal for the Humanities: Liberal Arts and the Future of Public Higher Education* (New Brunswick: Rutgers University Press, 2015). On the neoliberal university, see Martha Nussbaum, *Not For Profit: Why democracy needs the humanities* (Princeton: Princeton University Press, 2016); Lee Trepanier, *Why the Humanities Matter today: In defense of a liberal education* (Lanham: Lexington Books, 2017); Judith Butler, "Ordinary, Incredulous," Edited by Peter Brooks and Hillary Jewett, *The Humanities and Public Life* (Oxford University Press, 2014): 15-38.

justify the humanities and its public worth makes good sense. However, arguments employed to justify humanistic studies—for example, that they transcend the values of neoliberal ideology or that they must (or should) exist "outside" of the market—merely place the humanities in more peril: every justification accepts the necessity of justification. Butler suggests that in a world which requires us to inhabit a public, ethical action requires us "to think critically about modes measurement and schemes of evaluation."[40]

If there is anything truly "new" in new feminist materialism, it may be that the humanities engages with science, not in order to "do" science, but rather, to "innovate the Two Cultures gap in the strict sense of the term (humanists and scientists)" in the university understood as a political economic and social entity itself.[41] My provocation here is that new material feminism is firmly grounded in the humanistic and ethical activities specifically found in the academy, and that these are being deployed as a site for political action. The fact that new materialism and Barad's diffractive method have spread so rapidly in the field of Education perhaps attests most convincingly to this concern for the future of the academy, and the scholars who work within it.[42]

As Butler insists, measures and valuations from neoliberalism (profit, loss, privatization, etc.) have proven to be insufficient for "saving" the humanities. New material feminists have not yet considered the crucial importance that our understandings of measurement might play in the project to innovate the contemporary university. It is here that this dissertation ultimately might intervenes upon the new materialist discourse, since I largely consider the question of measurement in quantum physics as a productive problem which contributes to the creation of new modes measurement for the humanities, especially as they relate to feminist writing practices. Whether or not these measuring tools might be one day capable of engaging ethical action and intervening on the place and role of the humanities and the value of academic feminism remains to be seen.

2.

To set the stage for such future questioning, however, requires that we look carefully into how precisely these feminists are engaging with quantum physics, if not as scientists or empirical researchers. And moreover, how do these engagements transform feminism? Is this merely a metaphorical engagement? Or does it function as a general analytic for a new kind of feminism? And if so, what's at stake in merging the concepts and methodologies of physics with feminist theory and practice? Are these feminists calling for a new kind of scientism, or are they calling for something far more subtle, akin to the study of experimental practices in science and technology studies?[43] And furthermore, are these feminists sacrificing any of the hard-fought victories from earlier feminisms? How do language and meaning, for example, figure in this new quantum feminism? Are they made irrelevant in order to embrace the physics? Perhaps most crucially, when feminists champion quantum physics, what aspects of this challenging work are

[40] Butler, "Ordinary, Incredulous."
[41] "Memorandum of Understanding," COST New Materialism, 2013.
[42] Louisa Allen, *Schooling Sexual Cultures: Visual Research in Sexuality Education* (Taylor & Francis, 2017); Anna Hickey Moody and Tara Page, *Arts, pedagogy and cultural resistance: New materialisms* (Rowman & Littlefield International, 2015).
[43] Ian Hacking, "Experimentation and Scientific Realism," *Philosophical Topics* 13. (1982): 71-87 and *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science* (New York: Cambridge University Press, 1983); Joseph Rouse, *How Scientific Practices Matter: Reclaiming Philosophical Naturalism* (Chicago: University of Chicago Press, 2003).

they using, and what are they leaving out? In essence, what this dissertation concerns itself with is how quantum physics, of all things, has come to have such a hold on the imagination of feminists in the humanities.

My argument in this dissertation is essentially that new material feminists have a very selective reading of quantum physics. I will show how they valorize the notions of entanglement and diffraction, which have come to be synonymous with connectivity, inclusivity, and becoming. For feminists, this has opened up a whole new intellectual genealogy which links quantum physics to theorists such as Gilles Deleuze, Henri Bergson, Gilbert Simondon, and Alfred North Whitehead. While these are productive "inclusions" that get feminism out of language-centered modes of criticism, they are very often guilty of a cursory reading of the science of entanglement that elides the much more difficult and controversial aspects of the concept. In particular, I demonstrate that measurement is one of the key trajectories of the new quantum feminism, and yet that it is precisely measurement and in particular the quantum concept of decoherence that constitute a problem for quantum physics, and thus render entanglement a much more complicated set of practices than new material feminists make them out to be. Given that measurement is a crucial factor in defining the "new" in feminist new materialism, I endeavor to bring decoherence into sharper focus for the problem of measurement in feminist new materialism. In particular, I want to explore what a new material feminist writing practice that is attentive to the decoherent aspects of entanglement would look like.

To do so, this dissertation has four chapters that take up different aspects of the feminist appropriation of quantum physics. Chapter 1 evaluates new material feminism's great faith in the work of Barad to "save feminism" from the effects of the linguistic turn and social constructionism. The chapter begins by outlining her theory of agential of realism, which Barad hopes will contribute both to science and to issues within feminism. Barad critiques current social theories that she argues are grounded in Newtonian principles and that harbor three basic assumptions which severely limit our ability to think through the problems we face today: individualism, humanism, and representationalism. Expanding on Donna Haraway's figuration of "diffraction" as a new optics, Barad develops a new critical method of diffraction, one that utilizes concepts from quantum mechanics to resituate feminist theorizing as specifically materially embedded. While feminist epistemology's situated knower was thought to affect and be effected by scientific knowledge production, Barad's agential realism radicalizes the knower as entangled and emergent with the sets of material practices that comprise scientific work. In the last several years, Barad's diffractive method has gained traction in many disciplines, including education, anthropology, comparative literature, film and new media studies, sociology, and even theology to destabilize the relations between the knower and known.

Exploring the ways in which the diffractive method has been taken up as a method in the critical humanities, I find that four basic tendencies emerge: diffraction as a metaphorical framing for thought, diffraction as a reading practice that produces effects in the world, diffraction as affirmative critique, and diffraction as an ambiguous "between" space that challenges boundaries. Barad's theory of agential realism is grounded in quantum physics, and yet I found that diffraction is deployed in terms of merely classical physics. This refusal to notice the difference between classical and quantum diffraction may be a symptom of humanities scholars with little or no background in science (unlike many STS scholars) who cannot recognize the difference. While this is not an argument for the rigors of science, I do want to emphasize that this lack of understanding of the science keeps feminist new materialism tethered to the very Newtonian assumptions they are trying to avoid.

New material feminists blame the linguistic turn for the development of anti-biologism in feminism, and thus "reject" language from their more material concerns. This "rejection" of language never really happens, of course, since language is the central mode of engagement in the literary and critical fields of the humanities. The rejection of language thus might be taken as more symbolic than actual. In other words, as they turn *toward* science, new material feminists seem to think that at the same time they must also turn *away* from language and writing. I argue that, on the contrary, it is necessary to engage with language ever more "real-istically." Finding ways to think seriously about the materiality of language would map more effectively onto Barad's quantum insights. It would also further the new material feminist project to create new abstractions "that are equipped to do justice to the crisis European societies face in the 21st century."[44] Barad takes from Niels Bohr the notion that vocabularies, theories, and concepts are material, and I take this seriously. Radicalizing the knower/known relation involves reflecting on and conceptualizing how our modes of engagement are entangled in the emergence of entities and subjects.

Given that the prospect of a specifically "quantum" method of diffraction has yet to be explored, Chapter 2 provides a preliminary sketch of what this sort of method might look like. Nobel prize winning theoretical physicist Richard Feynman declares that classical and quantum physics are "impossibly different," so in order to unpack those differences, I open the chapter by examining the science. First, I present experiments from the early twentieth century that led to two important discoveries in quantum mechanics: particle-wave duality and electron spin. These experiments serve to demonstrate the relevant differences between classical and quantum diffraction, as well as introduce useful quantum concepts, such as interference, superposition, complementarity, inseparability and decoherence. In feminist new material discourse, although it is assumed that "exclusions matter," very little attention is paid to the precise nature of those exclusions, and none is paid to specifically to what could be called "quantum" exclusions. On the contrary, diffractive readings often privilege the quantum term "entanglement," but deploy it in terms of a wave metaphor from classical diffraction that implies connectedness and inclusivity. In other words, I argue, despite the claim that "exclusions matter," the diffractive method has largely excluded exclusions from its practice.

Therefore, and second, I bring exclusions back into the diffractive method through an explanation of the mysterious Measurement Problem in quantum physics. Although physicists don't agree on how to solve this so-called problem, they (mostly) agree that measurement interference is crucial to the transition, or "drop," from indeterminacy to a determined state. This is called "decoherence." The universe is not "everywhere connected," or simply and universally "entangled;" rather, "measurements matter" because decoherence is the crucial transition from indeterminacy to determined state. Applied to the quantum method of diffraction, then, the privileging of entities that only "combine and overlap" is necessarily insufficient; any quantum mode of diffraction, I argue, must also account for the exclusionary practices that operate to produce representations, intelligibility, and knowledge. Feminist new materialism could thereby account for its exclusion of decoherence, and thereby put it to use. I conclude the chapter by asserting that a quantum diffractive method cannot simply be an "affirmative" reading practice that interprets texts; rather, it is a genealogical practice that traces out the invisible representational practices involved in producing intelligibility which ground a given textual interpretation.

[44] "Memorandum of Understanding," COST Action, http://www.cost.eu/COST_Actions/isch/IS1307

Moving beyond the interpretive strategies of diffraction that visualize ever more entangled relations, Chapter 3 focuses in on decoherence as an exclusionary practice that matters for new material feminism. New material feminists are keen to "undo dualisms," especially the lingering one between language and reality, but their "de-constructive" attempts, I argue, maintain the ontological separation of language and reality. Language, I suggest, is a problematic field that requires a creative response. Therefore, following the critical assessment of new material feminist diffractive methods in Chapter 1 and the demand to incorporate decoherence into a proposed quantum diffraction method in Chapter 2, I am led in Chapter 3 to map some new conceptual territory. I turn to the works of Gilles Deleuze and Félix Guattari in order to render visible the surprising relations between their work on rhizomatics and the measurement apparatus in quantum physics. There is a conceptual parallel, I contend, between two separate occlusions in these two discourses. First, rhizomatics was conceived as a general analytic, and consequently left out the specific guidelines on writing. Although numerous scholars remark on Deleuze and Guattari's "preoccupation with the book" in *A Thousand Plateaus*, writing is utterly neglected in the commentary. Second, the diffractive method has privileged the notion of connection in quantum entanglement, and consequently, has left out decoherence from diffraction. This chapter reclaims both omissions—"the book" and "decoherence"—and draws them together. Following on what Deleuze and Guattari have to say about diagrammatic writing as an alternative to the literary text, I theorize an experimental practice of writing that I call "decoherent writing." It is my contention that decoherent writing would expand on the diffractive method and intervene on the new material feminist project to bridge the gap between the humanities and the sciences.

Chapter 3 showed how writing was excluded from rhizomatics and decoherence was excluded from the diffractive method. Carrying this idea of constitutive exclusions over into Chapter 4, I offer a genealogical investigation of particular exclusions that produce diffraction as a "new optics" for new material feminism. In other words, I use the idea that writing practices make necessary exclusions to understand the conditions of possibility for new material feminism to exist as a material writing practice. Their "new diffractive optics" involves the dismantling of negative critique in favor of an affirmative form of critique. This new affirmative criticality has become a hallmark of feminist new materialism. In this chapter I demonstrate how an affirmative reading practice can only exist on the condition that language and poststructuralism are excluded. I pay special attention to the very specific rhetorical techniques that make this constitutive exclusion possible. What is and must be excluded are the invisible conditions of possibility for these new materialist modes of viewing. In the end, I show how feminist new materialism must exclude exclusions in order to promote affirmation. Engaging with the quantum concept of decoherence offers a way to highlight and account for the constitutive exclusions of feminist writing practices.

# Chapter One
# Karen Barad and the Critical Method of Diffraction

*"Existence is not an individual affair."*
~Karen Barad

*"In difference is the irretrievable loss of the illusion of one."*
~Donna Haraway

*"'Between' will never be the same."*
~Karen Barad

## Introduction

In *New Materialisms: Ontology, Agency, and Politics*, editors Diana Coole and Samantha Frost proclaim the inadequacy of contemporary textual approaches for understanding contemporary society. The editors warn us that steeped in the linguistic play heralded by postmodernism, critical and social theory have "exhausted" themselves: outdated and irrelevant, inadequate to contemporary society, and with little or no connection to science, reality, or facts, we must admit, they insist, that as a concept, social constructionism is fundamentally flawed. What is needed is a new paradigm, a "stubbornly realist attitude" with the ability to integrate the material with the discursive.[45] The damage incurred from the linguistic turn has been catastrophic for feminism, claim editors Susan Hekman and Stacy Alaimo of *Material Feminisms*.[46] Steeped in social constructionism, they declare that second wave feminist theories are no longer relevant and as a result, feminism has fallen into a severe crisis. Hekman even claims that feminists have become "dis-eased" from losing sight of the material realm. The damage done by social constructionism pervades the humanities, they say.[47] The recent outpouring of volumes committed to new materialism(s) attests to its veritable force across disciplines, but it shows up most consistently and prominently in feminism and feminist science studies.[48] Iris van der Tuin and Rick Dolphijn call new materialism "a wave approaching its crest."[49] New materialism is a philosophical and critical movement that responds directly to the human- and language-centered biases that have pervaded humanistic work since Immanuel

[45] Diana H. Coole and Samantha Frost, *New Materialisms: Ontology, Agency, and Politics* (Durham: Duke University Press, 2010). Also see Haraway, *Simians, Cyborgs, and Women*: *The Reinvention of Nature* (London: Free Association, 1991); Bruno Latour, "Has Critique Run out of Steam? from Matters of Fact to Matters of Concern." *Critical Inquiry* 30.2 (2004): 225-48.
[46] Susan Hekman and Stacy Alaimo, *Material Feminisms* (Bloomington: Indiana University Press, 2009), 25.
[47] Susan Hekman, *The Material of Knowledge: Feminist Disclosures* (Bloomington: Indiana University Press, 2010).
[48] Iris Van der Tuin and Rick Dolphijn, *New Materialism: Interviews & Cartographies* (Ann Arbor: Open Humanities, 2012). In addition to the texts already mentioned, see Estelle Barrett and Barbara Bolt, *Carnal Knowledge: Towards a 'new Materialism' through the Arts* (London: Tauris, 2013); Geoff Pfeifer, *The New Materialism Althusser, Badiou, and Žižek* (Florence: Taylor and Francis, 2015); Roger Rothman and Ian Verstegen, *The Art of the Real. Visual Studies and New Materialisms* (Newcastle upon Tyne: Cambridge Scholars, 2016); Joerg Rieger and Edward Waggoner, *Religious Experience and New Materialism: Movement Matters* (Basingstoke, Hampshire: Palgrave Macmillan, 2016).
[49] Dolphijn and Van der Tuin, *New Materialism,* 16.

Kant's critical turn. New materialists attempt to unpack and undermine the binaries that have haunted Western modernity and postmodernity: for example, between nature and culture, subject and object, but also those "forgotten binaries," between ontology and epistemology, and language and reality. New materialist feminists also recognize the "loss" of matter, and attempt to create new, more intimate connections between matter and discourse. Acknowledging that "exclusions matter," a return to the material should not, they emphasize, be characterized as a privileging of matter, but rather as a re-thinking of its relationship to discourse. The re-integration of matter, it is thought, will revivify theory, and allow feminists to engage more critically and effectively with the pressing political and ethical concerns of our time.

For Hekman and many other feminists, the antidote for the "dis-ease," as well as hope for the future of feminist theory and practice, lies in the work of Karen Barad. Hekman names Barad as *the* feminist science critic who has done the most to outline a position that avoids the pitfalls on either end of the nature-culture pendulum swing. The advantage of Barad's work, Alaimo and Hekman argue, is her critique of the linguistic turn; blinded by their focus on "unconstrained play," Hekman claims, poststructuralist and postmodernist theories have merely reinscribed the dualisms they claim to deconstruct.[50] Barad stands out from the crowd in her refusal to entertain the linguistic games of many poststructural feminists, claiming that, "the ubiquitous puns on 'matter' do not, alas, mark a rethinking of the key concepts (materiality and signification) and the relationship between them."[51] As both scientist (she earned her doctorate in theoretical physics at Stony Brook University) and feminist (professor of feminist studies at UCSC), Barad represents everything that social constructionism lacks. As such, Barad is awarded the central position in Hekman and Alaimo's volume, *Material Feminisms,* which seeks to "bring material to the forefront of feminist theory and practice." Barad's essay, "Posthuman Performativity" is reprinted in the volume, and in addition to the praise she receives in Alaimo and Hekman's introduction, more than a third of the fourteen essays refer directly to Barad's work. Barad's theory of agential realism, the editors announce, "is a powerful and influential theory that reveals the unique strengths of the 'material feminisms' advocated in the volume."[52]

Similarly, Dolphijn and Van der Tuin find an intimate connection between Barad and the new materialist project in their volume, *New Materialism: Interviews and Cartographies* (2012). Divided into two parts, the first half contains four interviews with materialists Rosi Braidotti, Manuel DeLanda, Quentin Meillassoux, and Karen Barad. Following the interviews, the editors note that they have purposefully organized the second half of the volume according to Barad's neologism of "intra-action," or "the action *between* (and not *in-between*)."[53] Dolphijn and Van der Tuin utilize Barad's term in order to situate the agency of their volume: what deserves our special attention is not of the interviewees or interviews, "but of the orientation the interview gave rise to (the action itself)." The editors champion Barad's formulation of realism "allows the reader to gain a deeper understanding of the new materialist tradition."[54]

In this chapter, I evaluate the great faith currently being placed in the work of Karen Barad by new material feminists who hope to reinvigorate feminist theory and practice for our times. In order to understand the influence of Barad's work more clearly, the first part of this

[50] Alaimo and Hekman, *Material Feminisms*, 6.
[51] Karen Barad, "Posthumanist Performativity: How Matter Comes to Matter" *Signs: Journal of Women in Culture and Society* 28.3 (2003): 801-31.
[52] Alaimo and Hekman, *Material Feminisms*, 12.
[53] Dolphijn and Van der Tuin, *New Materialism*, 14.
[54] Ibid.

chapter outlines Barad's basic theory of agential realism. Agential realism offers an alternative to current social theories founded on Newtonian principles, which Barad argues harbor three limiting and outdated assumptions: individualism, representation, and humanism. Barad promotes instead the quantum principles of emergent entanglement, performativity, and posthumanism. Second, the chapter uses two reviews of Barad's book, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Meaning and Matter* (2007), to highlight the crucial role that the diffractive methodology plays for Barad's theory; there is, I argue, an unacknowledged problem in the work of new materialists who attempt to follow Barad's method, namely that they fail to distinguish between the classical and quantum modes of diffraction. The difference between the two models is incommensurable, and yet no one has yet to point out this glaring oversight; as a result, followers of Barad's diffractive method employ a merely classical model of diffraction. Third, I outline the physical phenomenon of diffraction, and look to some examples in which humanities scholars of various stripes apply the diffractive method to their fields. I find that four distinct tendencies have emerged in the widespread application of the diffractive method, each of which fails to integrate the quantum elements that make Barad's methodology unique.

The diffractive methodology is employed, albeit unknowingly, as a merely classical notion of diffraction; very often, it is also assumed to be a critical method of reading. In the second chapter, I explore Barad's diffractive method in more detail through the "Measurement Problem" in quantum mechanics. As the major "unsolved mystery" in quantum mechanics, the measurement problem is a rich focal point for an investigation of diffraction, since it highlights the relevance of the measuring devices for the existence of things. The second part of the next chapter outlines Barad's concept of the apparatus in concert with an exploration of the notion of measurement in the measurement problem of quantum mechanics in order to sketch some rough outlines of a particularly quantum diffractive mode that would be adequate for addressing the feminist political and ethical issues of our times.

## Baradian agential realism

The opening lines of *Meeting the Universe Halfway* state the matter simply: "Matter and meaning are not separate elements."[55] It is this notion of separation—the key to classical physics—that has caused the crisis in feminism which Barad's work challenges. Inspired by the quantum investigations of Niels Bohr, Barad proposes that separation is not an inherent feature of the world.[56] Unfortunately, most of our social theories were founded on and continue to rely on this outdated belief in atomism, whereby separate entities with inherent properties move around in a void propelled by separate forces. A clearer understanding, she argues, of updated theories in physics could completely reconfigure our deeply entrenched assumptions about the nature of the universe, and have wide-ranging affects both in and beyond the domain of physics. In providing "an account of how discursive practices matter," Barad hopes to "sharpen the theoretical tool(s) for feminist theory."[57] Barad's "onto-epistem-ology" defines itself against three basic assumptions of Newtonian physics: individualism, representationalism, and humanism. Each of the three assumptions requires an ontological split, a bifurcation or gap between realms that require bridging. Barad's alternatives to classical physics—emergent

[55] Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham: Duke University Press, 2007), 3.
[56] Ibid., 135.
[57] Barad, *Meeting the Universe*, 135-136.

entanglement, performativity, and posthumanism—offer a quantum detour through those splits and toward a new materialist realism she calls "agential realism."

## The First Split: Individualism

Individualism entails the belief that the world is composed of two opposing constituents; on the one hand, individual entities or atoms that are literally, "un-cuttable," and on the other hand, "void," understood simply as "nothing." By nature, atoms remain unchangeable, having an internal essence or substance as well as determinate boundaries and properties. Atoms remain separate from the void. Unable to fuse or change, atoms move about in the void, colliding with one another and combining into clusters. Newtonian physics extended the ancient or "mechanical" version of atomism in two main ways: first, by theorizing a hierarchy of particles (atoms are made up of even smaller particles); second, discovering that atoms and their "minima" are both held together by attractive and repulsive forces (there is more "out there" than simply void).[58]

Barad refers to this tradition of atomism in classical physics as a process of "thingification" whereby what should be understood fundamentally as relations are mistakenly understood as "things." It was Bohr's interpretation of diffraction experiments that made explicit the breakdown of independent entities in atomistic physics. The "wave vs. particle" debates over the nature of light and matter, Bohr argues, revealed the indefinite nature of boundaries.[59] By 1930, quantum physicists had embraced the view that microscopic phenomena have both wave and particle aspects.[60] As a counterpoint to classical metaphysics which takes "things" as ontologically basic entities, Barad adopts the Bohrian model of quantum physics, which states that reality is not made up of independently existing entities, but of "things-in-phenomena."[61]

According to Barad, not entities, but phenomena are "ontologically primitive relations—relations without preexisting relata."[62] In other words, rather than pre-existing and separate individuals with their own set of properties that relate to other pre-existing individuals (connecting, clustering, or forming communities), the "weird quantum" world is a dynamic process of materialization whereby determinate "things" emerge only in their "*intra*-actions" from indeterminate phenomena. To emphasize the difference between classical physics and quantum physics, Barad uses the neologism "*intra*-act." Designating a metaphysical shift, "'*intra*-action' *signifies the mutual constitution of entangled agencies."*[63] Entities do not preexist their relations, but emerge through their entangled *intra-acting*. Only through specific agential intra-actions do boundaries, properties, and "things" become determinate:

---

[58] "True motion is neither generated nor altered, but by some force impressed (*vis impressa*) upon the body moved," *Principia*. For a discussion of true and relative motion in Newton, see Gideon Freudenthal, *Atom and Individual in the Age of Newton: On the Genesis of the Mechanistic World View* (Dordrecht: Springer, 1986). For a discussion on the religious connotations of "true motion," see Larry Stewart, "Seeing through the Scholium: Religion and Reading Newton in the Eighteenth Century," *History of Science* 34 (1996): 123-65.

[59] Barad, *Meeting the Universe*, 104-106.

[60] Alyssa Ney and David Z. Albert, *The Wave Function: Essays on the Metaphysics of Quantum Mechanics* (Oxford University Press, 2013). The quantum leaping of particles, or what Einstein famously called, "spooky action at a distance," is widely accepted today, not only in science, but also by popular audiences. See Van Der Tuin, Iris. "Microaggressions as New Political Material for Feminist Scholars and Activists: Perspectives from Continental Philosophy, the New Materialisms, and Popular Culture." *Australian Feminist Studies* 31.89 (2016): 246-62.

[61] Barad, *Meeting the Universe*, 140.

[62] Ibid., 139

[63] Ibid., 33, italics in the original.

…entities are not separately determinate individuals but rather inseparable parts of a single phenomenon. In particular, there are no preexisting-individually-determinate-entities-with-determinate-spatial-positions-communicating-instantaneously-at-some-remove-from-one-another outside of a phenomenon that determinately resolves the boundaries and properties of the entangled components in a way that gives meaning to the notion of individual. Indeed, "individual" is ontologically and semantically indeterminate in the absence of an apparatus that resolves the inherent indeterminacy in a way that makes this notion intelligible[64]

Rather than assuming a prior separation, agential realism proposes that intra-actions enact the very separations that seem to pre-exist. Reality is thus counter-intuitively composed not of things-in-themselves, but of "things-in-phenomena."[65] What we call an "individual," then, Barad proposes, is an entangled emergence, or what might be called the productive effect of individuating processes.

## The Second Split: Representationalism

Observing the behavior of the very smallest objects is a difficult business. Since scientists cannot view and test the quantum universe directly, they have designed advanced technological tools that allow them to visualize quanta and perform experiments. For example, the scanning tunneling microscope (STM) developed in 1981 by Gerd Binning and Heinrich Rohrer at IBM is an instrument developed for imaging surfaces at the atomic level. It is based on the concept of quantum tunneling. Very simply, a metallic needle maps the surface by scanning across it while applying a small electrical current. The current "tunnels" through the gap between the tip and the surface. By measuring the current and representing it on a screen, scientists are able to "see" a topography of the microscopic surface.[66] Due to its incredibly small scale, physics requires complex technological machinery like the STM to produce "representations" of quanta. But "everyone knows" not to confuse the representations with the quanta "themselves."[67]

However, it is precisely these temptations of representationalism that we should resist, Barad and others argue. Representationalism is the belief in an ontological distinction between representations and what they represent.[68] Barad notes that both science studies and poststructuralism have long challenged the assumptions involved in representationalism.[69] She cites not only Foucault's anti-representational approach, but also Ian Hacking's and Joseph Rouse's critiques of representationalism in science. Rouse and Hacking argue that representationalism is not a logical necessity, but rather, the result of "a historically and culturally contingent belief that is part of our [Cartesian] legacy"; as such, representationalism is what they call "a habit of mind."[70] The various challenges to representationalism, Barad argues,

---

[64] Barad, *Meeting the Universe*, 316.
[65] Ibid., 140.
[66] On scanning tunneling microscopy, see G. Binning and H. Rohrer, "Scanning Tunneling Microscopy," *IBM Journal of Research and Development* (2nd ser. 44.1 2000): 279-93; J. A. Golovchenko, "Tunneling Microscopy," Edited by F. W. De Wette, *Solvay Conference on Surface Science: Invited Lectures and Discussions, University of Texas*, Austin, TX, Dec. 14-18, 1987 (Berlin: Springer-Verlag, 1988): 198-215; Paul K. Hansma, and Jerry Tersoff, "Scanning Tunneling Microscopy," *Journal of Applied Physics* 61.2 (1987): R1-R24.
[67] See Michael Lynch and Steve Woolgar, *Representation in Scientific Practice* (Cambridge: MIT, 1990); Hacking, *Representing and Intervening.*
[68] Barad, *Meeting the Universe*, 37.
[69] Ibid., 47.
[70] Barad, *Meeting the Universe*, 49.

make it clear that "representation is a practice of bracketing out the significance of practices;"[71] Barad characterizes the correspondence theory of representation as a "failure":

representationalism marks a failure to take account of the practices through which representations are produced. Images or representations are not snapshots or depictions of what awaits us, but rather, condensations or traces of multiple practices of engagement.[72]

Taking account of representational practices means, for Barad, rendering visible the invisible practices involved in the act of representing. Reminding us of the complicated, entangled sets of practices involved in the scanning tunneling microscope, Barad gives an "abbreviated" list of all the bracketed-out but significant practices necessary for the invention, promotion, and use of this technology:

> STM microscopes and practices of microscopy, the history of microscopy, scientific and technological advances made possible by scanning tunneling microscopes, the quantum theory of tunneling, material sciences, IBM's corporate resources and research and development practices, scientific curiosity and imagination, scientific and cultural hopes for the manipulability of individual atoms, Feynman's dream of nanotechnologies, cultural iconography, capitalist modes of producing desires, advertising, the production and public recognition of corporate logos, the history of the atom, the assumption of metaphysical individualism, complex sets of visualizing and reading practices that make such images intelligible as pictures of words and things, and the intertwined histories of representationalism and scientific practice.[73]

It is far from exhaustive, yet this list of invisible practices that make the STM possible is the beginning of an account of the complicated, historical processes that allow for any visualization. We don't merely sit back at a distance and see the world around us with our eyes. As Barad says, "The separation of fact from artifact depends on the proper execution of [each step] and requires skill and know-how achieved through experience.[74] Seeing is a produced and productive "effect" of action.

Understanding sight as a productive effect achieved by representational technologies might be easier to accept in situations where scientists are engaging with tools aimed at the quantum scale and invisible to the naked eye. However, seeing macro-scale objects can be more difficult. Science has depended upon the validity of visual evidence since its inception. However, Bohr challenges visualization as a process even at the macro scale, including the givenness of human bodily boundaries:

> One need only remember the sensation…which everyone has experienced when attempting to orient himself in a dark room with a stick. When the stick is held loosely, it appears to the sense of touch to be an object. When, however, it is held firmly, we lose

[71] Ibid., 47.
[72] Ibid., 53.
[73] Ibid., 360.
[74] Ibid., 53.

> the sensation that it is a foreign body, and the impression of touch becomes immediately localized at the point where the stick is touching the body under observation.[75]

The example of holding a stick loosely or tightly serves to show how visual clues seem to constitute the empirical approach—*clearly* the person and the stick are separate objects. However, Bohr continues, these empirical assumptions are misleading: visual "self-evidence" is actually the condensed result of repetitive culturally and historically specific bodily performances. Extending Bohr's argument, Barad argues that ontologically speaking, the boundary between the person and the stick is inherently ambiguous. The subject and the object are not fixed, but become determined (that is, they emerge as separate) through the particular practice. The two practices of holding the stick are mutually exclusive: *either* a subject engages in the practice of holding the stick loosely and enacts a cut with the result that both subject and stick are determined, *or* the subject engages in the practice of holding the stick firmly and enacts a cut with the result that a tapping "seer" in the dark is determined. It is only in the practice of holding loosely or tightly that a cut or resolution is produced, and the entities become determined. Once a particular cut is made, from the particular enactment of a practice, the "thing" (in this case, either a stick and a person or a blind "seer" in a dark room) becomes materially specified and determinate for a given practice.[76]

What is at issue for Barad in Bohr's "seeing the dark" example, is what she refers to as "differential material embodiment," that is, two different potential material configurations of ontological bodies that emerge from their blurry boundaries, even at the macro level. Rather than simply accepting "the taken-for-granted features of normal embodiment," Barad troubles the givenness objects in the act of seeing. The point bears repeating: we do not sit back passively and see the pre-given world—not even the macro world—at a distance. In order to believe that we simply "see," humans must first embark upon a double sleight of hand maneuver: first, humans interact with the world to materially enact the effect of seeing, and second, humans condense and bracket out, or forget their hand in composing these material practices, thus allowing for the belief in an ontological split between things and their representations.[77] Barad challenges the correspondence theory of representation by replacing it with a system in which "doing begets being," where practices enact determinate entities from indeterminate ones. Following the lead of Judith Butler, Barad calls this direct activity "performativity":

> Performative approaches challenge the assumption that there are representations, on the one hand, and ontologically separate entities awaiting representation, on the other, and focus inquiry on the practices or performances of representing, as well as the productive effects of those practices, and the conditions for their efficacy.[78]

---

[75] Bohr essay, (1963), quoted in Barad, *Meeting the Universe*, 99. Barad notes that Merleau-Ponty (1962) and Bohr use almost exactly the same example, but with different emphases.

[76] It is worth noting the ability to "see" the subject and the stick as ontologically entangled is, in turn, entangled with the grammatical necessity of using two separate nouns to describe their "entanglement."

[77] Barad relies heavily on the earlier work of Ian Hacking and Andrew Pickering on the critique of representationalism in STS. Critiques of representationalism can also be found in the areas of philosophy of mind, cognitive science, neurophenomenology, and Artificial Intelligence, for example: Alva Noë, Evan Thompson, Francisco Varela, Humberto Maturano, David Chalmers, and Andy Clark.

[78] Barad, *Meeting the Universe*, 49.

In contrast to representationalism, which presumes an ontological gap between things and their representations, performativity entails a theory and practice in which humans "intra-act" in direct entanglements to produce complex visualizations. These visualizations are what allow scientists to "see" facts, artifacts, bodies, and experimental data and results. Furthermore, what we call visualizations is not limited to the visual realm, but involves many other technologies. Performativity entails both the acts of creating "representations" and the ability "to see" how those representations were made.

## The Third Split: Humanism

The metaphors of transparency or opacity of the world have connected seeing to knowing for centuries. The ancient Greek verb *oida* (οἶδα, second perfect tense) means both "to have seen" and also therefore, "to know" (based on the present stem εἶδον—"to see"). In traditional humanist accounts, intelligibility requires a seeing-and-thus-knowing subject, and intelligibility is viewed as a capacity that is specifically and exceptionally human. It is here that we see that the ontological distinctions required for a belief in both representationalism and individualism are wrapped up with a third distinction: the human. As both an individual (separate and pre-existing) and as a knower (having the power to represent), the concept of the "human" reinforces and is reinforced by the other two assumptions of Newtonian physics. Barad decries humanism as the belief that "the human" refers to "an individually determinate entity with inherent properties, like the ability to engage in cognitive functions that make the universe intelligible."[79]

In a representational world composed of two distinct kinds of things (things-in-themselves and their representations), "the knower" acts as a kind of third node, an independent entity who exists "in-itself" and who is endowed with the ability to facilitate a mediation between the two other independently existing realms.[80] A third presupposed ontological gap thus emerges between the human knowing subject and both the known and the knower's representations of the known. Since the gap between realms is presumed impossible to close, the humble knower sits in isolation, always at a representational distance from the known world; the best he can do is to attempt to achieve the most accurate representations possible. From this ontological state emerges the distinction between realist and anti-realist positions: realists attempt to describe the objective world as best they can, while anti-realists understand the gap as being one of our own making; having no access to the "real world," anti-realists continue to create subjective, experiential, and technological representations of a world.

According to Barad, while both Butler and Foucault's poststructuralist critiques of representationalism attempt to rectify the gap between the material and the discursive realms, they both fall back into the humanist trap. Butler moves away from the traditional notion of matter as a passive surface waiting to be inscribed by culture, as a static and uncontestable ground; she reconceptualizes matter as a temporal process of differentiating relations in a matrix through which matter (and gendered subjects) comes into being.[81] Barad argues that while insightful, Butler's concept of performativity nevertheless fails to see matter as an active agent participating in the materialization process. Limited to human social practices and to effects on human bodies, Butler thus reinscribes passivity back onto the material by assuming that activity belongs only to the realm of the social and human action. Foucault's critique of representationalism replaces linguistic representation with "the constitutive aspects of discursive

[79] Barad, *Meeting the Universe*, 23.
[80] Ibid., 47
[81] Ibid., 57

practices in their materiality," but fails to theorize specifically in what way the biological and historical are bound together. Although bodies are marked historically, Foucault's notion of the material is also passive; and although the boundaries of the human are continually reworked, it is unclear in Foucault precisely how these markings occur.[82] In other words, Butler and Foucault may have bridged the gap between matter and meaning, but they cannot close it entirely due to their privileging of the "the human."

Barad's agential realism refuses to privilege the human as a preexisting entity endowed with intention or agency; on the contrary, agential realism is "posthuman" in two ways. First, matter is agential; matter is not relegated to exist as passive raw building blocks available for human activities (historical, cultural, social, political, subjective, personal, etc.). In recognizing matter's dynamism, agential realism does not require a rational human actor operating in the representational mode, but proposes instead a materially direct mode of differential responsiveness of which humans are a part. Second, agential realism does not view matter as static and fixed, because matter is not fundamentally a "thing." Rather, all "things" are ontologically indeterminate, entangled, and emergent. Intra-actions don't occur between "things" alone; rather, entanglement refers to the mutual constitution of objects with their objects-with-their-agencies-of-observation. Values, properties, and connections between things only "matter," that is, emerge *after*, by means of a prior process of determination. Matter is conceived not as a thing but as a doing, a congealing of agency: matter is a process of iterative intra-activity.[83]

Refusing the anthropocentrism of both humanism and anti-humanism, Barad's posthumanist vision for agential realism refuses the "obvious" divisions between human and nonhuman, nature and culture, discursive and material, and requires instead an accounting of the boundary-making practices by which the "human" and its others are differentially defined. Humans are not the condition of possibility for the existence of phenomena, Barad argues, and phenomena don't require cognizing minds for their existence. On the contrary, "minds" themselves are material phenomena that emerge through specific intra-actions:

> Humans are not spectators to the world, nor pure cause, nor mere effect. Rather, humans themselves emerge through specific intra-actions; measurements of all kinds are causal intra-actions of the world in its differential becoming. Humans are a part of the nature we seek to understand.[84]

Human bodies neither preexist (humanism) nor are they merely end products (anti-humanism); they are neither purely cause nor purely effect but "part of the world in its open-ended becoming."[85]

Posthumanism becomes particularly transformative in thinking through the notion of intelligibility. In contrast to humanist accounts that require a seeing-knowing subject to produce intelligibility, Barad's conception of intellection is "an ontological performance of the world in its ongoing articulation."[86] Intellection need not be performed by a human mind, but is defined by Barad as the "posthuman capacity of differential responsiveness to what matters."[87] Knowing

[82] Barad, *Meeting the Universe*, 65.
[83] Ibid., 151.
[84] Ibid., 352.
[85] Ibid., 150.
[86] Ibid., 149.
[87] Ibid.

entails neither transparency nor opacity, but rather, knowing is a matter of intra-acting. Knowing entails specific practices through which the world is differentially articulated and accounted for.

If intelligibility does not require a human, and matter is the differential responsiveness of intra-activity, then knowing can be dis-articulated from the visual metaphors in representationalism that have connected seeing and knowing for so long, and re-articulated as differential responsiveness. The invertebrate cousin of the starfish, the brittlestar, provides a real world example for Barad's notion of responsive intelligibility. Named for their fragile limbs which can easily regenerate, the brittlestar's arms are covered in micro-lenses which are aligned to produce kind of compound eye that allows the animal to see all around, like a camera building an image pixel by pixel.[88] The eyes are self-organized, emerging from its chemical environment, rather than being essential to or "built" by the animal itself. Thus, Barad claims that brittlestars "don't have eyes, they *are* eyes."[89] For a brittlestar, being and knowing, materiality and intelligibility, substance and form, entail one another. The brittlestar animal has no brain, no cognizing center who agonizes over the gap between itself and things beyond itself, but is instead a living, breathing visualizing apparatus built from its environs. Brittlestars literally enact Barad's agential realist entangled practices of knowing and being. These strange animals challenge our Cartesian habits of mind, she says, and break down the usual visual metaphors for knowing along with its optics of mediated sight. For the brittlestar, no optics of mediation is necessary and thus no question of representation arises. Rather,

> its very substance is morphologically active and generative and plays an agential role in its differential production, its ongoing materialization. That is, its differential materialization is discursive—entailing causal practices reconfiguring boundaries and properties that matter to its very existence.[90]

In Barad's capable hands, knowing is shown to be a physical practice of engagement. Knowledge-making is not a mediated activity, according to Barad, but a direct material engagement, a practice of intra-acting with the world as part of the world in its dynamic material configuring, its ongoing articulation. In traditional humanist accounts, intelligibility requires an intellective agent (to which something becomes intelligible), but in the agential realist account, intelligibility is an ontological performance of the world in its ongoing articulation; knowing does not require human intellection, but is a matter of differential responsiveness to and accountability for what matters. Like brittlestars, human knowers can be incorporated into the emergent entanglements they help to create:

> Knowing is not an ideational affair, or capacity of the human. Knowing is a material practice, a specific engagement of the world where part of the world becomes differentially intelligible to another part of the world in its differential accountability to or for that of which it is a part.[91]

Performative practices would render explicit the condensed and bracketed material entanglements of representational practices, thereby restoring them to the field of phenomena:

---

[88] *Nature*, August 21, 2001. http://www.nature.com/news/2001/010823/full/news010823-11.html
[89] Barad, *Meeting the Universe*, 375.
[90] Ibid., 376.
[91] Ibid., 342.

"Knowing is a physical practice of engagement, and there should be an account of it."[92] In other words, Barad's agential realism entails an ontology of knowing, one that critiques traditional notions of human knowing as a mediating activity.[93]

## From the Self-Reflexive to the Diffractive Method

Barad attempts to undo the binary divisions embedded in three assumptions that pervade social theories based on Newtonian physics: individualism, representationalism, and humanism, paying particular attention to practices of intelligibility, for example, knowing, theorizing, conceptualizing, observing, and measuring. She utilizes quantum physics to replace its assumptions that demand the priority of separation with immanent alternatives: emergent entanglement and posthumanism performativity. The method she uses throughout is what she calls "diffractive." Her diffractive framework has been enthusiastically embraced by new material feminists and feminists of technoscience studies.[94] Two journals recently devoted special issues to Barad's work: *Parallax's* "Diffracted Worlds, Diffractive Reading: Onto-Epistemologies and the Critical Humanities," applies Barad's diffractive method to the critical humanities more broadly, and *Rhizomes: Cultural Studies in Emerging Knowledge* entitled, "Quantum Possibilities: The Work of Karen Barad," explores the crucial insights of her work.[95] The radiance of Barad's theory of agential realism and its diffractive method thus shines far beyond the narrow field of new material feminism, and stretches to reach diverse fields, including scholars hailing from science studies, philosophy, education, film and media studies, anthropology, urban studies, food and animal studies, and comparative literature.[96]

The attention is well deserved. Barad's *Meeting the Universe Halfway* is nothing short of remarkable. Although trained in theoretical physics, Barad has moved into more interdisciplinary spaces of late. Barad elegantly explicates the complexities of quantum physics, all the while provocatively unfurling her new "ethico-onto-epistem-ology." With equal facility, Barad engages various disciplines, perspectives, and methods: she offers not only historical background to and clear explanations of scientific theories, experiments, and their results and consequences, she also performs a close reading of Michael Frayn's Tony Award-winning play, *Copenhagen*, she critically extends Judith Butler's concept of performativity from *Bodies that Matter*, she

---

[92] Barad, *Meeting the Universe*, 342.
[93] Ibid., 73.
[94] Including the aforementioned Hekman and Alaimo volume, *Material Feminisms* and Dolphijn and Van der Tuin, *New Materialism,* also see Hekman, *The Material of Knowledge* and Alaimo, *Bodily Natures: Science, Environment and the Material Self* (Bloomington: Indiana University Press, 2010); Rosi Braidotti, *The Posthuman* (Cambridge: Polity Press, 2013); Anneke Smelik and Nina Lykke, *Bits of Life: Feminism at the Intersections of Media, Bioscience, and Technology* (Seattle: University of Washington Press, 2008).
[95] Kaiser and Thiele, "Diffraction: Onto-epistemology, Quantum Physics and the Critical Humanities"; Peta Hinton and Karen Sellberg, "Quantum Possibilities: The work of Karen Barad," special issue, *Rhizome* 30, 2016.
[96] Recent references to Barad's "agential realism" include Žižek, Slavoj, *Less than Nothing: Hegel and the Shadow of Dialectical Materialism* (London: Verso, 2013); Levi Bryant, *The Democracy of Objects*; Dorothea Olkowski, "Every 'One'—a crowd, Making Room for the Excluded Middle" and Luciana Parisi, "The Adventures of a Sex," both in Nigianni, Chrysanthi, *Deleuze and Queer Theory* (Edinburgh: Edinburgh University Press, 2010); Rick Dolphijn and Iris van der Tuin, "A Thousand Tiny Intersections: Linguisticism, Feminism, Racism, and Deleuzian Becomings" in Arun Saldanha and Jason Michael Adams, *Deleuze and Race* (Edinburgh: Edinburgh University Press, 2013); Tara J. Fenwick and Richard Edwards, *Actor-network Theory in Education: A Focus on Educational Change* (Oxford: Blackwell, 2011); Mark Deuze, *Media Life* (Cambridge: Polity Press, 2012); Tim Ingold, *Making: Anthropology, Archeology, Art and Architecture* (London: Routledge, 2013); Janelle Taylor, *The Public Life of the Fetal Sonogram: Technology, Consumption, and the Politics of Reproduction* (New Brunswick: Rutgers University Press, 2008).

presents archival insights from the history of science, and she offers a genealogical analysis of Leela Fernandes's *Producing Workers* that simultaneously critiques feminist standpoint theory and offers in its place an agential realist account of the politics of identity. All the while she weighs in on fundamental questions in the area of quantum physics. Barad's proficiency across these disciplinary boundaries is nothing short of dazzling.

Reviewers of *Meeting the Universe Halfway*, however, do not agree on precisely the nature of Barad's contribution. Harvard historian of science, Silvan S. Schweber, reviewer for *Isis: Journal of History of Science in Society*, characterizes Barad's approach as "philosophical," "feminist," and "discursive," but not primarily scientific.[97] Going so far as to correct her science, Schweber highlights Barad's "wide ranging," "lively and literate" exposition. Although the book is, at times, "repetitive," and Barad sometimes gets "carried away by her curiosity, …her expository skills, and her ability to bend language to her will," Schweber nevertheless grants that the project "merit(s) serious attention" by historians, philosophers, and sociologists.[98]

By contrast, the review by Lisa Dolling for feminist philosophy journal, *Hypatia,* not only recognizes, but emphatically focuses on the rigor of Barad's science.[99] According to Dolling, Barad's strength is "the fact that she writes with the authority of theoretical physicist about a field that too often is co-opted by non-scientists." At the same time, Barad avoids the more "romantic appropriations" of quantum theory, and instead "provides the reader with [accessible] analyses of the central features of quantum physics."[100] Of central interest to Dolling and other feminists is Barad's critique of representationalism and her focus on the material over the linguistic:

> Barad explicitly dismisses language as a source of meaning, wondering aloud, when did language become so important? And declaring that "language has been granted too much power" and should no longer be the order of the day. Instead, for Barad the focus should be on "matter" in all its "mattering."[101]

What Barad offers that other scientists often fail to deliver, according to Dolling, is "serious scrutiny of all that is implied by quantum physics," particularly the role of humans as knowers in the world. While most scientists are happy to "shut up and calculate," Barad doesn't merely reflect on scientific practices; rather, she interrogates and takes account of the integral roles of human and nonhuman practices in shaping our world.[102]

These two reviews—*Isis*, a journal on the history and cultural influence of science and technology, and *Hypatia*, journal of feminist philosophy—provide opposing assessments of *Meeting the Universe Halfway*: on the one hand, the scientific review critiques Barad and finds

---

[97] Schweber, "Karen Barad. Meeting the Universe Halfway," 881.
[98] ibid, 881-882.
[99] Lisa M. Dolling, "Review of *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*," *Hypatia* 24:1 (January 2009): 212-218.
[100] Dolling, "Review," 217.
[101] Ibid., 215.
[102] It is not entirely clear who first said, "Shut up and calculate," but the motto is most often attributed to Richard Feynman, despite the fact that N. David Mermin, physicist from Cornell University, claims it as his own. Mermin says it emerged from his experience in graduate school, where his professors urged him not to distract himself with the "frivolities" of conceptual questions that would threaten his chances of finishing the PhD. He interpreted his professors' attitudes as, "Shut up and calculate." See N. David Mermin, "What's wrong with this pillow?" *Physics Today* (April 1989, Vol. 42, Issue 4): p. 9 and "Could Feynman have said this?" *Physics Today* (May 2004, Vol. 57, Issue 5): p. 10. Following Bohr's philosophy-physics, Barad attends to both calculations and concepts.

her work lacking comprehensive, scientific fact-giving, and relegates her work to the subordinate discipline of philosophy.[103] On the other hand, the feminist review characterizes Barad as the hero of feminism who will save the field, someone who is able of rescuing quantum mechanics from both unreflective scientists and romantic non-scientists. Perhaps stating the obvious is useful in this instance: both reviewers, first, privilege science (Schweber because it is his discipline; Dolling because her discipline lacks its rigor); and second, remain beholden to and thus reproduce the strict boundary claims of each their own academic disciplines.[104] Although both reviewers recognize Barad's work as engaging a "multi-disciplinary" approach (Schweber negatively and Dolling positively), neither gives a second thought to Barad's treatment of the nature of the disciplines themselves. As a result, both reviews completely miss the transdisciplinary tenor of her project and the diffractive method so key to achieving it.[105]

In outlining her methodology, Barad clearly states that she is not interested in reading disciplines *against* each other.[106] Rather, her approach seeks to understand how these boundaries come into being in the first place. She calls her method "diffractive" to reflect the overlapping movement of waves encountering an obstacle. The diffractive project entails

> …engag[ing] aspects of each in dynamic relationality to the other, being attentive to the iterative boundaries, the material-discursive nature of boundary-drawing practices, the constitutive exclusions that are enacted, and questions of accountability and responsibility for the reconfigurings of which we are a part That is, the diffractive methodology that I use in *thinking insights* from different disciplines (and interdisciplinary approaches) *through one another* is attentive to the relational ontology.[107]

Relationality is pertinent not only to the emergence and dynamism of "things," but also to the emergence and dynamism of disciplines, argues Barad. Her approach "is to place the understanding that are generated from different (inter)disciplinary practices in conversation with one another…that is,…to engage aspects of each in dynamic relationality to the other."[108] Following a definition outlined by Rosemary Hennessy (1993), Barad defines a transdisciplinary approach as one that "does not merely draw from an array of disciplines but rather inquires into the histories of the organization of knowledges and their function in the formation of subjectivities"[109]

---

[103] From Schweber's scientific perspective, philosophy as a discipline depends upon propositions, and therefore language and "literariness." This perspective is challenged by many process philosophers, including Alfred North Whitehead, *Process and Reality: Corrected Edition,* Edited by D.R. Griffin and D.W. Sherburne (New York: Free Press, 1978). For a reading of Whitehead's propositions with Barad's agential realism, see Melanie Sehgal, "Diffractive Propositions: Reading Alfred North Whitehead with Donna Haraway and Karen Barad." *Parallax* 20.3 (2014): 188-201.

[104] A consideration Barad's transdisciplinarity overlaps with, but is beyond the scope of this project, but she argues that transdiscplinarity is rich enough to support the production of myriad new pedagogies, disciplines, and forms of rigor, new discussion around canonization, etc. See Barad's discussion, *Meeting the Universe*, 93.

[105] It is interesting to note that elsewhere Barad recognizes her debt to postmodern and poststructuralist feminism: "Diffraction owes as much to a thick legacy of feminist theorizing about difference as it does to physics." See Barad, "Diffracting Diffraction: Cutting Together-Apart," *Parallax* 20.3 (2014): 168-87.

[106] Barad, *Meeting the Universe*, 92.

[107] Ibid., 93, emphasis mine.

[108] Ibid.

[109] Ibid., 93; Barad quotes Hennessy (1993).

In short, Dolling and Schweber have each demonstrated a form of what Barad calls "thingification," or the "turning of relations into 'things.'"[110] Maintaining rigid disciplinary boundaries displays a clear misunderstanding of Barad's diffractive method:

> It is difficult to see the diffraction patterns—the patterns of difference that make a difference—when the cordoning off of concerns into separate domains elides the resonances and dissonances that make up diffraction patterns that make the entanglements visible.[111]

In addition, Dolling and Schweber's privileging of science flies in the face of Barad's project. She neither unilaterally "explore(s) the lessons of physics for social and political theories," nor takes the opposite tack by "counter(ing) the overblown authority of science by suggesting a reversal whereby the social sciences would be a model for the natural sciences."[112] Barad attributes no disciplinary privilege in her work, nor does she assume that disciplinary boundaries stand still. As she contends, being entangled is "not simply to be intertwined with another… but to lack an independent, self-contained existence."[113] She denies that physics can give a full account of the social world: "it would be wrong," she says, "to simply assume that people are the analogues of atoms and that societies are mere epiphenomena…or that sociology is reducible to biology, which is reducible to chemistry, which in turn is reducible to physics."[114] In fact, it is the dynamic irreducibility of the universe that interests Barad most: "Reductionism has a very limited run." And further:

> To write matter and meaning into separate categories, to analyze them relative to separate disciplinary technologies, and to divide complex phenomena into on balkanized enclave of the other is to elide certain crucial aspects by design. On the other hand, considering them together does not mean forcing them together, collapsing important differences between them, or treating them the same way, rather it means allowing any integral aspects to emerge (by not writing them out before we get started).[115]

Barad neither rejects the linguistic realm in favor of scientific studies, as Dolling and others suggest, nor does she merely dabble in science for the purpose of "bend(ing) language to her will," as Schweber suggests. On the contrary, in her refusal to "analyze relative to separate disciplinary technologies," Barad's strategy is a transdisciplinary refusal to engage reductively with any given object or discipline. "If we follow disciplinary habits of tracing disciplinary-defined causes through to the disciplinary-defined effects, we will miss all the crucial intra-actions among these forces that fly in the face of any specific set of disciplinary concerns."[116] Barad's method in *Meeting the Universe Halfway* entails taking an account of the practices—especially the practices that produce exclusions—that serve to constitute a given object or a given discipline.

---

[110] Barad, *Meeting the Universe,* 93.
[111] Dolphijn and Van der Tuin, "Barad interview," *New Materialism*, 50.
[112] Barad, *Meeting the Universe*, 92.
[113] Ibid., ix.
[114] Ibid., 24.
[115] Ibid., 25.
[116] Barad, "Posthumanist Performativity," 128.

Taking account for one's practices and positionality has long been a part of feminist epistemology, most notably standpoint theory, intersectionality, and Haraway's situated knowledges.[117] Feminists and sociologists of scientific knowledge (SSK) have also adopted self-reflexive methods in their critique of scientific realism, in an attempt to take account of their own role in producing evidence.[118] However, Barad distinguishes herself from these practices as well, noting that the very same scholars who self-reflexively situate their positionality often failed to realize that they were unreflectively engaging in social realism, that is, the reification of important categories of the "social" and the privileging of them over the "natural." The point, according to Barad, "is not simply to put the observer or knower back in the world (as if the world were a container and we needed merely to acknowledge our situatedness in it)."[119] Neither scientific nor social realism can adequately account for the role that humans play in what Barad calls "the differential constitution and differential positioning of the human among other creatures (both living and nonliving)."[120]

The critical practice of reflexivity remains dependent upon the three assumptions associated with Newtonian physics: individualism, representationalism, and humanism. A self-reflexive method maintains a rational human subject, a self-reflexive human knower who stands apart from the world and make(s) knowledge. This "distance learning" cannot account for the fact that "*practices of knowing are specific material engagements that participate in (re)figuring the world.*"[121] As opposed to the binary between scientific/social realism, Barad's theory of agential realism, "is not calibrated to the human; on the contrary, it is about taking issue with human exceptionalism." In contrast to self-reflexivity, posthuman performativity does not "attribute the source of all change to culture…in fact it refuses the idea of the natural (or for that matter, a purely cultural) division between nature and culture."[122]

Nor does agential realism take objectivity for granted. In the reflective methodology, representations simply "reflect" or "mirror" reality; as a separated realm, representations have limited effects on the real. As such, reflexivity remains an epistemological theory and cannot account for the ontological gap between the knower and the known. The goal for Barad is to understand and take account of the fact that "we too are part of the world's differential

---

[117] See Kimberle Crenshaw, *On Intersectionality: Essential Writings* (London: New Press, 2016); Sandra Harding, *Science and Social Inequality: Feminist and Postcolonial Issues* (Champaign: University of Illinois, 2006); Smith *Conceptual Practices of Power*; Hill Collins, *Black Feminist Thought.*

[118] For example, see Latour, Bruno, and Steve Woolgar. *Laboratory Life: The Construction of Scientific Facts*. Princeton: Princeton University Press, 2006.; Ian Hacking, *The Social Construction of What?* (Cambridge: Harvard University Press, 1999); Andrew Pickering, *Constructing Quarks: A Sociological History of Particle Physics* (Chicago: University of Chicago Press, 1999), *Science as Practice and Culture* (Chicago: University of Chicago Press, 1992), *The Mangle of Practice: Time, Agency, and Science* (Chicago: University of Chicago Press, 2010). Anne Fausto-Sterling, *Myths of Gender: Biological Theories about Women and Men; Includes a New Chapter on Brain Anatomy, Sex Differences, and Homosexuality* (New York: Basic Books, 1996), *Sexing the Body: Gender Politics and the Construction of Sexuality* (New York: Basic Books, 2000), *Sex/gender: Biology in a Social World* (New York: Routledge, 2012); Gaymon Bennett and Paul Rabinow, *Designing Human Practices: An Experiment with Synthetic Biology* (Chicago: University of Chicago Press, 2012); Joseph Rouse, *How Scientific Practices Matter: Reclaiming Philosophical Naturalism* (Chicago: University of Chicago Press, 2003), *Engaging Science: How to Understand its Practices Philosophically* (Ithaca: Cornell University Press, 1996).

[119] Barad, *Meeting the Universe*, 91.

[120] Ibid., 136.

[121] Ibid., 91, emphasis in the original.

[122] Ibid., 136.

becoming," and that in that becoming, epistemology and ontology are also not distinct, but entangled.[123] Agential realism is an "onto-epistemological" project, that is, one that refuses the binary logic that forces a choice between privileging either the epistemological realm of the human or objective reality. Neither does agential realism merely attempt to bring the two realms into "closer" proximity, or place materiality in a privileged position.[124] Barad argues that "even proximity takes separation too literally."[125] Agential realism involves more than simply bringing separate realms closer to one another; it means accounting for the methods and practices that work to constitute all relations, including relations understood in terms of "distance" and "proximity" that rely on a particular conception of space known as the separability principle.[126] Barad's practice of accounting for and "interfering" with the dynamic becoming of "things," rather than the things themselves, is precisely what she calls the "diffractive" method.[127] In the following section, I will outline in detail the physical phenomenon of diffraction and the history of Barad's use of diffraction as a method.

## Diffraction

In the classical physics understanding, diffraction is a physical phenomenon of wave behavior. Diffraction occurs when a wave bends around an obstacle or spreads through an opening and produces an interference pattern. All waves behave in this manner: water waves diffract around a jetty and amplify, a voice yells from behind a tree and diffracts sound waves so we can hear it on the other side; radio waves diffract around a building so that reception continues uninterrupted; light waves from a street lamp diffract through the weave of a curtain.

Physicists understand diffraction to be the result of the "interference" of waves, and often prefer to distinguish between diffraction (the spreading of waves upon encountering an obstacle) and interference (what happens when waves overlap). The overlapping of waves produces combinations; when waves meet and work together, water waves are agitated and amplified, or "interfere constructively." In regions where the peak of one wave crosses the trough of another and they cancel each other out, the waves "interfere destructively."[128] The combining effect of waves is called "superposition."[129]

---

[123] Barad, *Meeting the Universe*, 91.

[124] This is the project of many new material feminists, including Hekman and Alaimo, who follow Haraway's language of the "material-discursive," which claims to refuse the separation of the two realms. Lamenting the "loss" of the material, they attempt not only to "bring the material back in," but also "to bring, specifically the materiality of the human body and the natural world, into the forefront of feminist theory and practice." In *Feminist Disclosures*, Hekman is particularly susceptible to a nostalgic longing for the lost material, noting that "the loss of the material…places constraints on theory," that Haraway's materialist project was "lost" in the linguistic turn. For an insightful assessment of the relation of feminism and "loss," see Clare Hemmings, *Why Stories Matter: The Political Grammar of Feminist Theory* (Durham: Duke University Press, 2011).

[125] Barad, *Meeting the Universe*, 359.

[126] See Barad's discussion of the argument between Bohr and Einstein on questions of objectivity and separability in *Meeting the Universe*, 317-321.

[127] "Interference" refers here not to the connotation of "negative disturbance," but to the patterns produced by diffracting waves.

[128] Feynman calls the distinction between diffraction and interference an historical and arbitrary one; essentially, both name the same phenomenon. See Chapter 37, "Quantum Behavior," and Chapter 52, "Symmetry in Physical Laws," in Richard P. Feynman, Robert B. Leighton, and Matthew Sands, *The Feynmann Lectures on Physics*. Vol. 1. (New York: Basic Books, 2010).

[129] Barad, *Meeting the Universe*, 76.

Following the work of Donna Haraway, Barad extends the physical phenomenon of diffraction into a figuration for a methodological approach. Both Haraway and Barad credit the notion of diffraction back to Trinh Minh-ha's 1988 essay, "Not You/Like You: Post-Colonial Women and the Interlocking Questions of Identity and Difference."[130] Following the deconstructive method, Trinh uses diffraction as an alternative metaphor to reflection in re-conceptualizing difference for the identities of postcolonial subjects. This difference would be "a critical difference from within," as opposed to those caught in the binary opposition between self and other, modeled on the Hegelian logic of master and slave. Trinh outlines the binary logic operating to stabilize "othered" identities through negative difference; these "inappropriate/d others," as Trinh calls them, are left in a non-space between "self"/existence and "other"/non-existence. Unable to reach some imaginary and prior self, "inappropriate/d others," Trinh explains, on the contrary, exist "in critical, deconstructive relationality, in a diffracting rather than a reflecting (ratio)nality as the means of making potent connection that exceeds domination."[131] Trinh's model of diffraction, as Haraway sees it, imagines a subject "dislocated" from "the *taxon*," or the pre-given maps of identity that remain fixed.

Diffraction, Haraway argues, is a useful alternative to reflection, which has remained a pervasive trope for knowing. Haraway characterizes Trinh's notion of diffraction as "a metaphor that suggests another geometry and optics for relations" among people, humans, organisms, and machines, among other things.[132] Haraway suspects that

> reflexivity only displaces the same elsewhere, setting up worries about copy and original and the search for the authentic and really real…What we need is to make a difference … to diffract … so that we get more promising interference patterns … Diffraction is an optical metaphor for the effort to make a difference in the world.[133]

Both reflection and diffraction refer to optical phenomena, and as such, are dangerously caught up in scopophilic discourse; Haraway says that as "infinite" and "immediate," vision-as-knowing is always a myth, an illusion.[134] However, in an attempt to reclaim the visualizing tricks used to attain the myths, she hopes to "metaphorically emphasize vision again" through a new figure: diffraction. While reflection "invites the illusion of an essential, fixed position," diffraction, on the other hand, is relational and "entails the processing of small but consequential

---

[130] Trinh is quoted both in Donna Haraway, "The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others." *Cultural Studies*, Edited by Lawrence Grossberg, Cary Nelson, and Paula A. Treichler (New York: Routledge, 1992): 295-337 and in Karen Barad, "Diffracting Diffraction: Cutting Together-Apart." *Parallax* 20.3 (2014): 168-87. I think it is important to note that Barad traces the lineage of her method back to Gloria Anzaldúa as well as Trinh. See her discussion in Barad, "Diffracting Diffraction: Cutting Together-Apart" *Parallax* 20.3 (2014): 168-87. I find the silence in the new material feminist discourse surrounding this lineage deeply troubling. Clare Hemmings argues that white material feminists often discretely incorporate non-white feminists into their discussions as a sign of "progress." See Hemmings, *Why Stories Matter.*

[131] Haraway, "The Promises of Monsters, 17.

[132] Ibid.

[133] Donna J. Haraway, *Modest_Witness@Second_Millennium. FemaleMan©_Meets_OncoMouse™ Feminism and Technoscience* (New York: Routledge, 1997): 16.

[134] See "A Cyborg Manifesto: Science, technology and socialist-feminism in the late twentieth century" in Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (London: Free Association, 1991): 291-324. For more on scopophilia, see Luce Irigaray and Gillian C. Gill, *An Ethics of Sexual Difference*, Translated by Carolyn Burke (Ithaca, NY: Cornell University Press, 1993); Rosi Braidotti, *Nomadic Subjects Embodiment and Sexual Difference in Contemporary Feminist Theory* (New York: Columbia University Press, 2011).

differences."[135] Attending to patterns of difference, she argues, diffraction "trains us to a more subtle vision."

Trinh and Haraway use the more subtle vision of diffraction as a metaphor for re-valuing difference, and Barad is inspired by their work. She adopts the optical metaphors, claiming that diffraction is "an apt metaphor" for her methodological approach. Barad's diffractive method, echoing Haraway, "attend(s) to and respond(s) to the details and specificities of relations of difference and how they matter."[136] "First and foremost," Barad claims, "a diffractive methodology is a critical practice for making a difference in the world."[137] Barad's critical practice of exploring "differences that matter" has released a flood of scholarly work from various disciplines that utilize the metaphor of diffracting waves and/or the method of diffraction. In what follows, I lay out four tendencies that I find in adaptations of Barad's diffractive method by critical humanities scholars. In each case, the authors cite Barad's method of diffraction and use the concept in one or more of the following ways: diffraction as a metaphorical framing for thought, diffraction as a reading practice that produces literal effects in the world, diffraction as affirmative critique, and diffraction as a messy and ambiguous "between" space. Despite their disparate interests and disciplinary fields, every one of the following examples resemble each other in this respect: while citing Barad's diffractive method, the method they employ conforms to a classical rather than a quantum model of diffraction. Barad very simply states that diffraction is the study of "entangled effects." But the matter is in no way simple, since what "entangled" means for quantum entities is not merely complicated, by even according to physicists, "mysterious." And this is not Barad's last word on diffraction. Rather, her thesis contains multiple layers that will take the whole of *Meeting the Universe Halfway* to unravel.[138] Not only is Barad's notion of diffraction not merely metaphorical, it is also not merely classical. Indeed, how could it be? Barad states at the outset that agential realism offers an alternative to Newtonian (classical) assumptions of physics. More precisely, Barad outlines the classical notion of superpositioned waves in diffraction in the methods chapter only to dismiss it later: "our initial hypothesis…is wrong: superpositions do *not* represent mixtures of particles with determinate properties. Rather, *superpositions represent ontologically indeterminate* states."[139] In other words, Barad makes a leap from the physical phenomenon of classical diffraction to the register of quantum diffraction that few scholars have even noticed, much less are able of replicating.

This "quantum leap" marks a crucial point in Barad's work that many scholars employing the diffractive method have missed entirely. Before moving on to examine the literature, I should say that my argument is not merely a defense of Barad's work, nor do I wish to contribute to what I view as the recent "heroization" of her work.[140] It is not entirely clear whether a quantum method is either possible or desirable as a method for the critical humanities in general or for

---

[135] Barad quotes Haraway, *Meeting the Universe Halfway*, 29.
[136] Ibid., 71.
[137] Ibid., 90.
[138] Ibid., 74: "The full texture, complexity, and richness of [diffraction] will not shine through fully until the entire book has been read—until its diffractive articulation works its way through the grating of the full set of chapters."
[139] Ibid., 265, emphasis in the original
[140] Hemmings argues that each movement in feminism has its own "hero," one theorist whose work comes to stand in for an entire strain of thought; the naming of the hero works as rhetorical shortcut to invoke what she calls "academic common sense." See *Telling Feminist Stories*. I argue in Chapter 4 that Barad has become the "hero" of new material feminism.

new material feminist work in particular. I will expand on the potentials for quantum diffraction as a method in Chapter 3.

## Critical Diffractive Readings

In the *Parallax* special issue on Barad and diffraction, editors Birgit Kaiser and Kathrin Thiele highlight the impact that diffraction has and could have for the humanities. They invite humanities scholars to "sharpen the toolbox" by considering the frameworks, logics, and metaphors through which research in the humanities might develop new literacies for the problems of our modern world. These literary scholars, whose goal is to bridge the gap between the humanities and sciences, do not critique scientific entities and practices, but accept them "as is." Neither do they expect to affect scientific practices in the way that feminist STS aimed to. Their projects aim at different things (for example, theories of translation, the boundaries of comparative literatures and contexts, and so forth), but what they all have in common is their acceptance of science and its practices as "material," and that these "materials" constitute a ground for re-thinking their disciplinary issues.

Barad is appealing to literary scholars because she employs metaphors so enticingly. She claims that diffraction is the overarching trope for her book, and an "apt metaphor" for her method.[141] I have found that there are four ways that humanists who take up Barad's diffractive method tend to employ it. The most common among them is as to use diffraction as a metaphor that challenges old habits of thinking.[142] In his contribution to the *Parallax* special issue, Jacob Edmond's essay "Diffracted Waves and World Literature," explains how the metaphor of "waves" has been a useful tool for describing methods of "distant reading" in world literature; the notion of "waves" proposes that a text experiences "interference" as it passes into a new language, culture, and tradition.[143] However, metaphoricity, Edmond argues, has caused conceptual slip-ups, particularly when we forget that we are working with "just" metaphors. Diffraction is a better metaphor for the practices of engaging with world literature, Edmond argues, because it acknowledges itself as metaphor, and thus avoids any possible confusion between the model and the thing itself. The metaphor of diffraction is also better because it brings a certain dynamism to the practices of reading and translation. "Distant reading" practices cannot account for the dynamism of languages and cultures, Edmond argues; using diffraction and "close reading" instead, the full complexity of languages and culture emerge through illuminating "interference patterns."

Finally, since metaphors instruct our thinking, diffraction also alters the ways we think about "wider geopolitical and historical reality."[144] Edmond's model of diffractive reading pushes previously static elements of literary study into dynamic relations, and embraces the merits of metaphors for thinking; however, his method is emblematic of all studies that maintain the separation of "words" and "things," of language and reality. Insisting that metaphors re-framing tools, but not real in themselves, Edmond's diffractive method perpetuates the tradition of representationalism and dichotomy between language and reality that grounds it.

---

[141] Barad, *Meeting the Universe Halfway*, 71.

[142] For other examples, see Rouse, "Standpoint Theories Reconsidered," Karen Spector, "Meeting Pedagogical Encounters Halfway," *Journal of Adolescent & Adult Literacy,* 58:6 (March 2015); Lis Højgaard and Dorte Marie Søndergaard, "Theorizing the Complexities of discursive and material subjectivity: agential realism and poststructural analyses" *Theory & Psychology* 21:3, 2011: 338-354.

[143] Jacob Edmond, "Diffracted Waves and World Literature," *Parallax* 20.3 (2014): 245-57.

[144] Edmond, "Diffracted Waves and World Literature." For more on the ability of metaphors to produce insight, see Max Black, *Models and Metaphors* (Ithaca: Cornell University Press, 1962).

Rather than using diffraction as a "mere metaphor," Birgit Mara Kaiser's contribution to the Barad *Parallax* issue, "Worlding CompLit: Diffractive Reading with Barad, Glissant and Nancy" convincingly argues that, "as a mere lexicon imported from elsewhere, diffraction can do nothing."[145] Indeed, Kaiser reminds us that Barad's methodological approach is not *merely* metaphorical, but rather, for Barad, diffraction patterns are fundamental constituents of the world. Diffraction plays a role in nearly all optical phenomena, and occurs all round us: the iridescent wings of hummingbirds and dragonflies, the rainbow effect on a soap bubble, an oil slick in a puddle, and across the backside of a CD. Technological uses of diffraction can be found in bar codes scanned at grocery stores as well as in holograms. In other words, Barad's diffractive method of "reading insights through one another" can be viewed as producing patterns that are *literally* diffractive, whereby the interference patterns can be read as real "effects" in the world. Haraway insists that diffraction patterns don't map "where differences appear, but rather maps where the effects of difference appear" and Barad elaborates, taking the notion of diffraction as "a tool of analysis for attending to and responding to the effects of difference."[146] The second tendency in the diffractive method is the belief that reading practices are productive of interference patterns, that is, the practice of producing a textual interpretation is equated with producing literally "real effects" or consequences in the world.

For example, in their co-authored article, "The Ontological Force of Technicity: Reading Cassirer and Simondon Diffractively," Aud Sissel Hoel and Iris Van der Tuin read Ernst Cassirer and Gilbert Simondon by means of a diffractive method with the aim to produce "real effects" that "demonstrate the relevance of these thinkers for present day theorizing."[147] Bringing together Cassirer's "*Form und Technik*" (1930) and Simondon's *Du mode d'existence des objects techniques* (1958) for the first time, the authors find a whole host of similarities between the two: both Cassirer and Simondon must come to grips with the "being of technology," and each develop their own ontological priority of "technicity." In addition, they have a similar point of departure. Both Cassirer and Simondon "see technology as a philosophical challenge," and both claim that grasping the essence of technology will never occur without accepting it is a tool, rather than as a "thing." They note a few differences between the two works; however, Hoel and Van der Tuin hammer each of these differences back into "resonances": "Simondon's and Cassirer's work should not lure us into overstating the differences between their respective accounts… Cassirer's and Simondon's essays converge."[148] The method of diffractive reading as it is employed by Hoel and Van der Tuin actively intends to make "real" difference in the world by means of reading texts together, or as Barad puts it, by "making its way through the [diffractive] grating."[149] And yet, rather than demonstrating how these ideas or similarities intra-act with the world outside the text, this mode of diffractive reading tends to remain solely focused on traditional textual practices.

There are any number of ways one might imagine reading practices as analogous to the physical phenomenon of classical diffraction, but one way to fill out the logic of the analogy might be to say that Barad's method of "reading insights through one other" involves a human critical reader who acts like the barrier through which overlapping "waves" (authors, texts, ideas)

---

[145] Birgit Mara Kaiser, "Worlding CompLit: Diffractive Reading with Barad, Glissant and Nancy," *Parallax* 20.3 (2014): 274-287.
[146] From Haraway, "The Promises of Monsters," ihn Barad, *Meeting the Universe Halfway*, 72.
[147] Iris Van der Tuin and Aud Sissel Hoel, "The Ontological Force of Technicity: Reading Cassirer and Simondon Diffractively," *Philosophy & Technology* 26.2 (2013): 187-202.
[148] Van der Tuin and Hoel, "The Ontological Force of Technicity," 194.
[149] Barad, *Meeting the Universe Halfway*, 74.

interfere with one another either constructively or destructively as they "bend" around the obstacle (critical reader) to produce diffraction patterns, or "differences that make a difference." In this example, Hoel and Van der Tuin suggest that their article is "an experimental reading strategy" that aims to produce "an open cartography." Experimental openness too, remains within the linguistic mode, since all it means here is that other readers can add their own interpretations onto this one. Diffraction remains a practice that is internal to the text, and maintains the individualism and humanism of the reader through the assumption of a rational knower. The knower's reading practice is modeled on the metaphor of diffraction, their human interpretive skills serve as a stable barrier around which waves of ideas (Cassirer and Simondon) flow. However, the "barrier" cited to produce "difference patterns that make a difference," in this instance fails to read any difference, and finds only similarities. This "amplification" of waves involved typically combines constructively, rather than destructively. The effects show up in a pattern, in this case, a repetitive pattern where both Cassirer and Simondon explore the "same" issues and find the "same" results. Oddly, in amplifying their sameness through the diffraction metaphors, Hoel and Van der Tuin claim to have achieved very "different" results. In "reading these insights through one another," Hoel and Van der Tuin declare, they have established the present day relevance of Cassirer and Simondon.[150] It should be noted that the "real effects" (present day relevance of old ideas) are produced by means of an analogic practice whereby "interpretation" is viewed as operating "like" diffraction.

But waves don't always amplify when combined. For Melanie Sehgal, a diffractive reading produces combinations that are at once smooth and rough. Sehgal recognizes both possibilities in her diffractive reading of Whitehead, Haraway, and Barad, which

> not only accounts for the surprising convergence of these heterogeneous thinkers, it also accounts for the friction that such a bringing-together of heterogeneous texts necessarily generates, without explaining it away.[151]

Sehgal's argument for Whitehead's metaphysics as "non-conformal" seems at first glance to allow for a negative outcome, or what, following the logic of the wave analogy, would map onto the canceling out or weakening of overlapping waves. Barad does say that diffraction is helpful for "dislodging unwanted remnants and providing more refined tools."[152]In the end, however, Sehgal notes that Whitehead, too, used the term "diffraction," and argues that his metaphysics thus "embodies a diffractive proposition." In other words, she finds that Whitehead was "really" doing diffraction all along, and despite any apparent friction, "resonance" is what she finds between the three authors. Here again, in the diffractive method used to study the entangled "differences that make a difference," we find that the return to "sameness" is secured.

Many diffractive approaches assume that such "resonances," or the "smoothing over of difference" in the wave analogy, also invokes a positive combination that is not only desirable, but also distinctly "feminist." The third tendency of diffractive methods is that they are characterized as "affirmative" in nature. In a single-authored essay, Van der Tuin uses diffraction as a strategy to omit the unseemly phallocentric elements of philosopher Henri Bergson's work, and to recuperate or "affirm" the positive elements for the purposes of material feminism. This

[150] Van der Tuin and Hoel, "The Ontological Force of Technicity."
[151] Melanie Sehgal, "Diffractive Propositions: Reading Alfred North Whitehead with Donna Haraway and Karen Barad," *Parallax* 20.3 (2014): 188-201.
[152] Barad, *Meeting the Universe*, 27.

method, Van der Tuin insists, is part of the "affirmative phase of feminist philosophy," following Elizabeth Grosz.[153] In terms of the metaphor of diffraction, Van der Tuin's reading situates the two diffracted waves (Bergson and Barad) to combine "destructively," that is, to silently cancel out any unwanted (i.e., "masculinist") aspects of the text, thereby avoiding the need for negative critique. Van der Tuin refers to Barad, who cites Latour's lament against critique to emphasize her point:

> Wars. So many wars. Wars outside and wars inside. Cultural wars, science wars, and wars against terrorism. Wars against poverty and wars against poor. Wars against ignorance and wars out of ignorance. My question is simple: Should we be at war, too, we, the scholars, the intellectuals? Is it really our duty to add fresh ruins to fields of ruins? Is it really the task of the humanities to add deconstruction to destruction? More iconoclasm to iconoclasm? What has become of the critical spirit? Has it run out of steam?[154]

Barad borrows Latour's assertion that critique has run out of steam, and she quite frankly states, "I am not interested in critique. In my opinion, critique is over-rated, over-emphasized, and over-utilized, to the detriment of feminism."[155] However, she does not follow Latour's alterative critique which employs Alan Turing's notion of "going critical." Turing's metaphor of the explosion of ideas in a nuclear chain reaction is a metaphor that Barad finds "chilling and ominous."[156]

Van der Tuin's approach to diffraction as an affirmative method also draws on the disdain for war metaphors. Diffractive strategies, she implies, are also employed to replace violent images with peaceful and harmonious ones. Van der Tuin's diffractive reading achieves yet another form of "smoothing over" of differences; in this case, the rough waters of phallocentrism are smoothed over in order to offer up a new, more positive Bergson, and that "positivity" (as opposed to negativity) is what makes this Bergson palatable for feminism. Van der Tuin employs Barad's method of "reading through the diffraction grating" as a form of critique capable, as Barad says, of the "respectful engagement" of interference patterns.[157] Carol Taylor refers to it as "engaging critique as a close encounter of the generous kind." It is not meant to "be negative, hostile or destructive, but is "a gentle holding."[158] To employ the diffractive method in an affirmative mode, it seems, operates like waves that simply wash away any unsavory elements.

Each of the diffractive methods outlined thus far assumes the existence of a cognizing human actor (the reader) endowed with the ability to both witness and assess the value of interference patterns and their effects produced by diffracting waves. But other diffractive

---

[153] Van der Tuin, "A Different Starting Point, a Different Metaphysics: Reading Bergson and Barad Diffractively," *Hypatia* 26(1), 2011. See also Elizabeth A. Grosz, *Time Travels: Feminism, Nature, Power* (Durham: Duke University Press, 2005); Rosi Braidotti, *Transpositions on Nomadic Ethics* (Cambridge: Polity Press, 2012).

[154] Latour, "Has Critique Run Out of Steam?" For viewing critical engagement as affirmative and "slow," also see Kathrin Thiele, "In Critical Condition or Fully Out of Steam? Critical Thinking Today," (paper presented for "Terra Critica: Re-visioning the Critical Task of the Humanities in a Globalized World," December 7-8, 2012).

[155] Dolphijn and Van der Tuin, "Interview with Karen Barad," *New Materialisms: Interviews and Cartographies*, 49.

[156] Ibid.

[157] Barad, *Meeting the Universe*, 90.

[158] Carol Taylor, "Close Encounters of a Critical Kind: A Diffractive Musing In/between New Material Feminism and Object-oriented Ontology," *Cultural Studies? Critical Methodologies* 16.2 (2016): 201-12.

approaches focus on the emergent status of the human author.[159] In Barad's diffractive method, performativity plays a key role: there is no preexisting determinate boundary between subject and object, but rather, they too, "emerge through intra-actions."[160] In other words, "matter in its substance is not a thing but a doing."[161] In the cases I've outlined so far, the human reader acts like a critical barrier that amplifies or weaken waves, but in this more "posthuman" diffractive approach, the reader herself becomes an overlapping wave in superposition with the others. In "A diffractive and Deleuzian approach to analyzing interview data," education scholar Hillevi Lenz Taguchi describes her emergent identity:

> When reading diffractively I want to read *with* the data, understanding it as a constitutive force, working with and upon me in the event of reading it….In the first engagement with these excerpts, I install myself in the space where the adult interviewer brings one child at a time to a table to perform an interview. In this space, the table and chairs enact a space of interviewing. An event of *sitting* is enacted…[162]

Taguchi is not the interviewer here, but rather the reader of the interview transcript. In the act of reading the data, Taguchi argues that she is able to "install herself" in the written space of the document, as opposed to physical space. But the written space references the physical space of "tables and chairs," implying that "event" of her sitting is an ambiguous combination of written and physical space. In this sense, Taguchi attempts to overcome the boundaries of all the "objects," both inside and outside the text.

However, Taguchi, does not explore the various representational practices that produce her arts of "seeing" objects in this way. She still relies on the humanist assumption of a cognitive function that makes the universe intelligible. In the end, it is her "faculties," both physical and mental, that allow her to "read" the data differently. However blurry, the gap between knower and known is fully maintained, and the human remains the condition of possibility for the existence of phenomena. On the contrary, for Barad, "intellection is a posthuman capacity for differential responsiveness."[163] In other words, what are the material sets of practices that would allow Taguchi "see the data differently"? How might agency be dispersed across a wider field of material practices beyond merely human cognition? These questions are not explored. Instead, the tendency of diffractive methods is to reaffirm the reader as central to human cognition for intellection.

Patti Lather is another education scholar who also characterizes an event of reading and notes her self-emergence as researcher that she distinguishes from other familiar methods:

> intra-actionally speaking, installing the self in the event that emerges out of a diffractive reading in between such a conjunction produces something beyond interpretation, beyond autoethnography, beyond reflexivity, intentionality and rationality. Feeling the affect,

---

[159] Other examples include Lisa Mazzei, "Materialist Mappings in being: researchers constituted in the production of knowledge," *Gender and Education*, 25:6 (2013). Likewise, Elizabeth Grosz in *Time Travels*, Mazzei tries "to avoid the usual critical gestures," which focus on error, contradiction, and weakness; she prefers to seek out "positivities, crucial concepts, insights on what is of value," 2.

[160] Barad, *Meeting the Universe*, 89.

[161] Ibid., 183.

[162] Hillevi Lenz Taguchi, "A diffractive and Deleuzian approach to analyzing interview data," *Feminist Theory* 13(3) (2012): 265-281.

[163] Barad, *Meeting the Universe*, 149.

> what "happens" in the event and our sense-making of it blur as researchers are positioned otherwise.[164]

Lather's own positionality has "somehow" changed, albeit blurred in the act of making meaning through her analysis of the sexual abuse scandal at Penn State. This aspect of blurriness is a constant problem for diffractive readers, especially those who approach the diffractive reading strategy as a Deleuzian event. To acknowledge one's own self-emergence in the event of reading requires an aptitude not only for "feeling the affect," but also for what Brian Massumi calls "immediate self-complication,"[165] which is indeed "vague," but not because it is unclear or hard to describe, but because it is virtual. The event of reading has no connection to either virtuality or indeterminacy in Lather's Deleuzo-Baradian account.

In "The power of things! A 'new' ontology of sexuality at school," education scholar Louisa Allen takes this blurriness even further. Allen employs a method of analysis she characterizes as "reading [photographs] diffractively one through the other," whereby the photographs "project an obstacle that overlaps with my affective, embodied theorizing." Here too, we see the human reader positioned as emergent with other entities around a barrier. Her method requires "an alternative mode of seeing and thinking" which she describes as "hotspots," or "a kind of glow" which provoke a reaction in her that is "not totally articulable." Once again, the modes of seeing, thinking, and sensing are left unexplored and taken for granted. Allen describes the material of "the data," or, "how 'things' made their presence felt via their persistent appearance," as both "haunting" and "annoying." She describes these "a/effects" as "evoking the presence of active matter with agency." Matter is given both agency and presence, but without cause or explication; rather than the dispersed agency that Barad attributes to matter, Allen finds materiality's maneuvers "ghostly." Additionally, these haunting a/effects are the only "evidence" she has of the "messy" and "inter-connected" relationship between herself and her data. Rather than offering the precision that Barad insists upon, Allen succeeds in the opposite.

Playing on words, Allen complains that all of this messiness is not merely external, but also internally "messes with the mind." Finally, Allen draws her reader into the mess too, hailing "you—the reader" as "co-constitutive in an endless un/enfolding wave after wave."[166] After this dizzying mess, what remains for Allen is to equate materiality with messiness, which is unfortunate, since at the same time she evokes a kind of ineffable distance between language and materiality. This separation of language and reality is precisely what new material feminism has set out to deconstruct.

Despite the risks of the inarticulable, Lisa Mazzei finds messiness to be a hopeful process.[167] In coding sociological data in her field of education, Mazzei suggests moving away

---

[164] Patti Lather, "'Becoming Feminist:' An Untimely Meditation on Football," *Cultural Studies? Critical Methodologies* 12(4) (2012): 357-360.

[165] I refer to Massumi because he argues that vagueness contributes to "the ontogenetic indeterminacy that precedes and accompanies a thing's coming to be and what doesn't." It is this indeterminacy of diffraction that has been missing in new materialist accounts. See Brian Massumi, *Parables for the Virtual: Movement, Affect and Sensation* (Durham: Duke University Press, 2002), 13.

[166] Louisa Allen, ""The power of things! A 'new' ontology of sexuality at school," *Sexualities* 18(8) 2015: 941-958.

[167] Perhaps the messiness of diffraction is better attributed to Haraway than Barad, who argues, "What constitutes an apparatus of bodily production cannot be known in advance of engaging in the *always messy projects* of description, narration, intervention, inhabiting, conversing, exchanging and building. The point is to get at how worlds are made and unmade, in order to participate in the process." It is Haraway, not Barad, who is "drawn like a moth to the flame to those kind of knowledge-making endeavors where *messiness is inevitable*." Donna Haraway, "A Game of Cat's

from habitual normative readings towards diffractive ones that are able to "spread thought in unpredictable patterns" and produce "different knowledge."[168] Frustrated by the need to create "coherent and familiar narratives," Mazzei proposes to use Barad's diffractive method of "reading insights through one another." Unlike other readings, Mazzei's diffractive method prevents the practice of data analysis from a return to "sameness." While coding and data saturation rely on sameness within categories, she argues, a diffractive analysis on the other hand, "emphasizes difference by breaking open the data (and the categories inherent in coding) by decentering and destabilizing the tropes of liberal humanist identity work: the subject, interpretation, etc." To do diffractive work, according to Mazzei, means to thread the "*data into theory into data* resulting in multiplicity, ambiguity, and incoherent subjectivity."[169]

Mazzei's approach attempts to create different or "multiple" results, i.e. "real effects" in the world through reading interference patterns. Her diffractive reading produces "questions not possible otherwise," and seeks to consider how "texts materialize and at the same time produce subjectivities." In other words, her diffractive approach is "not just about bodies, nor just about words, but about the mutual production of both."[170] The results are indeed messy, and have the effect of muddling Mazzei's own subjectivity, but it is not entirely clear how these are effects are explicitly material. Citing Haraway's penchant for hyphenating, Mazzei rewrites the relation "material ←→ discursive," with arrows to indicate that rather than being merely "socially constructed" in a unilateral relation (discursive-material), the two sides exist in bilateral or "ambiguous" or co-constitutive relations. Mazzei insists that it is "our continuous negotiation with matter that posits texts as ontoepistemological entanglements." Her concern is not simply for a different type of knowing, but of a different type of being as she is constituted in this "process of knowing and intra-action with the material force of research texts." Our readings have the effect, Mazzei argues, of "throwing us in and throwing us out" of our subjectivities. Mazzei equates the back and forth movement of the subject's positionality to Deleuze and Guattari's concept of "plugging in."[171] The introduction of so many concepts has a blurring effect, but rather than "vibrating with possibilities," Mazzei's positionality takes a turn for the mechanistic, rather than machinic, mode. She utilizes multiple concepts only to return to a familiar form of positionality for the subject, one in which "we act on each other in ways that are not always discernable or predictable, thereby producing possibilities for becoming otherwise."[172]

While I am encouraged by the proliferation of interest in the diffractive method and I believe in the promise it may offer to feminist theory and practice, I find a number of tensions between Barad's employment of the method and others'. In her short methods chapter, Barad characterizes diffraction in ways that easily map onto various practices of critique I outlined above; she describes it as "the study of entangled effects that make a difference," as "reading

---

Cradle: Science Studies, Feminist Theory, Cultural Studies," *Configurations: A Journal of Literature and Science*: 59-71, p 63.

[168] Lisa Mazzei, "Beyond an Easy Sense: A Diffractive Analysis." *Qualitative Inquiry*. 20(6) 2014: 742-746.

[169] Emphasis in the original.

[170] Mazzei, "Beyond an Easy Sense," 745.

[171] Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia,* Translated by Brian Massumi (Minneapolis: University of Minnesota Press, 1987), 4.

[172] Mazzei, Lisa A. "Materialist mappings of knowing in being: researchers constituted in the production of knowledge." *Gender and Education* 25.6 (2013): 776-785. p 784.

insights through one another" and the study "the differences that make a difference."[173] To be fair, Barad's chapter on the diffractive method is shorter than the other more detailed chapters of *Meeting the Universe Halfway*. Diffraction receives only a quick overview, including a convenient table outlining the difference between reflection and diffraction.[174] In addition, the sheer complexity of cross-disciplinary threads that weave throughout the more than 500 pages of *Meeting the Universe Halfway* are bound to cause confusion even in the most astute scholars, so perhaps the messiness is somewhat inevitable. However, in what follows, I will address specific concerns about the adaptations of Barad's diffractive method as they relate to the four tendencies; following that, I will address more general concerns.

The most common tendency of diffractive methods is to use, either knowingly or unknowingly, diffraction as a metaphor. While Barad says it is her guiding trope, she also clearly states that "the drawing of analogies…[for analysis] are only of limited value, and are insufficient for understanding the deeper philosophical issues at stake in learning how to diffract [social practices.]"[175] Elsewhere, Barad claims that

> reasoning by analogy can easily lead one astray. And furthermore, it posits separate categories of items, analyzes one set in terms of the other, and thereby necessarily excludes by its own procedures an exploration of the nature of the relationship between them.[176]

Merely metaphorical or analogic uses of diffraction maintain the representationalist separation of words and things, and bracket out the direct, material engagement of an entangled world. Barad uses many metaphors but she never stops at the level of metaphor; rather, she accepts it as one productive practice in an ecology of other practices: "whenever this notion is invoked, either figuratively, methodologically, or in reference to physical phenomenon," and she asks her to

---

[173] The list of citations for this quotation is extensive: Florence Chiew, "Posthuman Ethics with Cary Wolfe and Karen Barad: Animal Compassion as Trans-Species Entanglement," *Theory, Culture & Society* 31.4 (2014): 51-69; Ezekiel J. Dixon-Román, "Diffractive Possibilities: Cultural Studies and Quantification," *Transforming Anthropology* (2015); Myra J. Hird, "Review: Feminist Engagements with Matter: Judith Butler: Live Theory by Vicki Kirby," *Feminist Studies* Vol. 35, No. 2 (Summer 2009): 329-346; Peta Hinton, "The Quantum Dance and the Worlds' Extraordinary Liveliness': Refiguring Corporeal Ethics in Karen Barad's Agential Realism," *Somatechnics* 3.1 (2013): 169-189; Højgaard and Søndergaard, "Theorizing the complexities of discursive and material subjectivity"; Birgit Mara Kaiser, "Worlding CompLit" and Kaiser and Kathrin Thiele, "Other Headings: Ben Jelloun, Derrida, Sansal and the Critique of Europe," *Interventions* (2015): 1-16; Hillevi Lenz Taguchi, "A diffractive and Deleuzian approach to analysing interview data," *Feminist Theory* 13.3 (2012): 265-281; Elizabeth MacKinlay, "A Diffractive Narrative About Dancing Towards Decoloniality in an Indigenous Australian Studies Performance Classroom," *Engaging First Peoples in Arts-Based Service Learning* (Springer International Publishing, 2016): 213-226; Mazzei, "Materialist mappings of knowing in being," and "Beyond an Easy Sense A Diffractive Analysis," *Qualitative Inquiry* (2014); Sophia Roosth and Astrid Schrader, "Feminist theory out of science: Introduction." *Differences* 23.3 (2012): 1-8; Joseph Rouse, "Standpoint theories reconsidered"; Melanie Sehgal, "Diffractive Propositions"; Karen Spector, "Meeting pedagogical encounters halfway," *Journal of Adolescent & Adult Literacy* 58.6 (2015): 447-450; Kathrin Thiele, "Ethos of Diffraction: New Paradigms for a (Post) humanist Ethics," *Parallax* 20.3 (2014): 202-216, and "Theorizing is Worlding—Teaching New Feminist Materialisms in Contemporary Feminist Theory Courses," *Teaching With Feminist Materialisms* 28 (2003); Iris Van der Tuin, ""A Different Starting Point, a Different Metaphysics": Reading Bergson and Barad Diffractively," *Hypatia* 26.1 (2011): 22-42, and "Diffraction as a Methodology for Feminist Onto-Epistemology: On Encountering Chantal Chawaf and Posthuman Interpellation," *Parallax* 20.3 (2014): 231-244.
[174] Barad, *Meeting the Universe*, 89-90.
[175] Ibid., 94.
[176] Ibid., 24-5.

reader to remember the particular "quantum weirdness" of superpositions.[177] In other words, metaphoric meaning cannot be simply separated from other materials: "Matter and meaning are not separate elements."[178]

Although Barad doesn't define the difference between classical and quantum diffraction in her methods chapter, she does explain that quantum superposition is nothing like superpositioned waves: "Superpositions are not a simple multiplicity, not a simple overlaying or a mere contradiction."[179] According to philosopher of physics David Z. Albert, quantum superpositions "are extraordinarily mysterious situations."[180] In the next chapter, I explore the peculiar nature of quantum superposition. For now, it is sufficient to say that Barad does not employ diffraction as a mere metaphor of classical diffraction; rather, in some implied sense, she attempts to employ diffraction as a quantum phenomenon.

Many diffractive methods have a tendency to focus on the production of literal effects of interference patterns, but also tend to maintain human exceptionalism through the productive role of the reader. Barad warns that "knowing is not an ideational affair." In fact, Barad repeatedly insists that our diffraction apparatus is an analytic instrument, and that analysis is not ideational.[181] Producing meaning of any kind is always a material practice for Barad. Following Bohr, Barad argues that our ability to understand the physical world "*hinges on our recognizing that our knowledge-making practices are material enactments that contribute to and are part of the phenomena we describe."*[182] Diffraction is treated by new material feminists as a textual practice (or a way of producing meaning from a text), but Barad argues that these reading practices are also not ideational (or "merely" textual); rather, these practices are material and entangled.

Posthuman performativity is not simply a metaphor for the practice of reading which simply combines the ideas of texts like waves. To produce any meaning at all is to engage in material practices, which are routinely overlooked in representationalist practices. It is rare, however, for authors working in the diffractive mode to account for their own productive representational practices. As Barad sees it, her method of diffraction is "so unlike methods of reading one text or set of ideas against another where one set serves as a fixed frame of reference" for the other. Diffraction, on the contrary, "involves reading insights through one another in ways that help illuminate differences as they emerge: how different differences get made, what gets excluded, and how those exclusions matter."[183] While Mazzei does interrogate her relation to the text and insists on the intra-action of ontology and epistemology, none of the authors investigate what their readings (*qua* material productions of meaning) have excluded, and how those exclusions matter.

On the contrary, the majority of authors seek to find only sameness in difference, despite the fact that Barad warns: "considering [matter and meaning] together does not mean collapsing important differences between them or treating them in the same way."[184] So-called "affirmative critique" as practiced by those who employ the diffractive method amounts to the a "gentle" exclusion of all difference, a smoothing over that actually reflects a desire for peaceful

[177] Barad, *Meeting the Universe*, 83.
[178] Ibid., 3.
[179] Barad, "Cutting Together-Apart," 176.
[180] David Z. Albert, *Quantum Mechanics and Experience* (Harvard University Press, 2000): 11.
[181] Barad, *Meeting the Universe*, 73.
[182] Ibid., 32, emphasis in the original.
[183] Ibid., 30.
[184] Ibid., 25.

conversation, rather than an affirmative philosophical approach which demands the dual movement of critique/construction. Further, imagined as "gentle" and positive, they choose to ignore rather than account for their own role in the production of exclusions that matter. In short, this method provides not illumination but erasure and remains firmly within the grips of representationalism.

Hoel and Van der Tuin's process of "smoothing over the rough waters," or finding sameness in difference, is precisely what they deem to be an "affirmative" critique. According to Vivienne Bozalek and Michalinos Zymbalis, the diffractive method seeks to "do no epistemological damage" by "pitting one theory/position/stance against another, but carefully and attentively doing justice to a detailed reading of different viewpoints."[185] Many employments of the diffractive method refer to Latour's 2004 essay on critique, but conflate his sentiments about critique as a war with a clarion call for positivity and peace that would overcome negativity. I want to suggest that a peaceful practice of textual critique is not the same as affirmative philosophy, which goes back at least as far as Nietzsche. One would be hard-pressed to call the cheerfulness of Nietzsche's gay science "positive." I will address the necessity for dual movements of critique/construction in further detail in Chapter 3 and affirmation in Chapter 4, but for now, suffice it to say that the conflation of affirmative philosophy with harmonious conversation not only points to a blind spot in these employments of the diffractive method, but also perpetuates the belief that feminist epistemologies are analogous to feminine stereotypes of women as "nurturing" and "loving." Affirmative critique never implies the absence of criticism, but is rather an active encounter outside of the representational mode.[186]

Putting ourselves into the equation is necessary, both as "human" and as individuals capable of producing complex representational apparatuses. But methods that simply seek to create "a web of causal relations that implicate [us]" is not in line with Barad's notion of diffraction and its real effects:

> If what is implied by "consequences" is a chain of events that follow one upon the next, the effects of our actions rippling outward from their point of origin well after a given action is completed, then to say that there are consequences to our actions is to miss the full extent of the interconnectedness of being….Effect does not follow cause hand over fist…There is no discrete 'I' that precedes its actions. It is not about momentum transfer among individual events or beings."[187]

Too often, the "effects" produced by diffraction methods are simply the attachment of new meaning to data or to a text; when this happens, the diffractive method becomes the means for just another interpretation. Meaning is envisioned as the direct consequence of the skills of a human reader-subject, and fails to be acknowledged as an effect of extended material practices, in Barad's terminology, an agential emergence of entities from phenomena. The complexity of "real relations" has yet to be explored outside of the representational framework of reading practices.

---

[185] Vivienne Bozalek and Michalinos Zembylas, "Diffraction or reflection? Sketching the contours of two methodologies in educational research," *International Journal of Qualitative Studies in Education* (June 30, 2016).
[186] Van der Tuin and Dolphijn cite Grosz (2000 and 2005) for "affirmative critique," but Grosz herself relies on Deleuze, who relies on Bergson, and so on. Barad refers only to Latour.
[187] Barad, *Meeting the Universe*, 394.

And finally, I find the tension between "messy" and "ambiguous" diffractive methods found in works by Mazzei, Lather, and Allen particularly troubling, given Barad's insistence on precision and specificity in the diffractive apparatus. It is important not to confuse entanglement with a lack of precision. The ontological status of objects and their agencies of observation must be described, conceptualized, and theorized in language. Both Niels Bohr and Erwin Schrodinger attributed incredible importance to the language of science. In the next chapter, I will address the role of language in quantum diffraction specifically as it relates to scientific measurements. It is my contention that if new material feminists use the diffractive method in their attempt to "radically rethink materiality, the very 'stuff' of bodies and natures,"[188] then it is also important that they try to avoid repeating the mistakes they accuse others of making in their commitments to the linguistic turn.

## Conclusion

These specific criticisms of the adaptations of Barad's diffractive method point to more general stakes for new material feminism. New materialists claim that critical theory has exhausted itself in the linguistic play of the social constructionism, and that we need a new "stubbornly realist attitude." But as it is currently practiced in the critical humanities, diffraction amounts to little more than a reading practice still bound up with representationalism, individualism, and humanism. At best, it operates as a new vocabulary for deconstructive readings; at worst, it devolves quickly into relativism and the very linguistic play that new material feminists seek to debunk.

Barad's agential realism strives toward a non-representational model of knowing, a model that theorizes thinking, reading, measuring, and observing (i.e., formally idealist practices conceptualized as separate from the world) as a new ontology of knowing: intelligibility is a direct and posthuman mode of differential responsiveness. This form of intelligibility operates through the diffractive method, which is "a critical practice of engagement" that "eschews representationalism and advances a performative understanding of…practices, including different kinds of knowledge-making practices."[189] If the diffractive method is a reading practice, then we cannot continue to assume its effectiveness by engaging it as a mere metaphor, a causal consequence, a positive attitude, or an imprecise "between space." To be used effectively as a reading practice, material feminists need to explore more rigorously the relation between what Barad calls "objects and the agencies of observation." In the next chapter, I will explore the nature of diffraction as an analytic apparatus that is productive of both objects and their agencies of observation, outside of the representationalist paradigm. But I also argue that material feminists should be exploring diffraction as more than just another reading practice. What the diffraction apparatus is, how to build one, and what it is capable of our questions that still need to be asked.

Second, the new material feminist project aims not to take matter for granted, and attempts to deconstruct the language/reality dichotomy. Hekman characterizes the problem as the need to integrate opposing approaches to the world: "Modernity chose the reality side;… postmodernity chose the language side." Faced with these constraints on theory, the challenge according to Hekman, is "to define a theoretical position that does not privilege either language or reality but instead explains and builds on their intimate interaction.[190] Although they claim to

[188] Hekman and Alaimo, *Material Feminisms*, 6.
[189] Barad, *Meeting the Universe*, 90
[190] Hekman, *The Material of Knowledge*, 3.

value and maintain the insights of poststructuralism, the rhetoric employed by many material feminists invokes "the limits" of the linguistic turn and social constructivism and "the loss" of the material. They very often cite Barad: "Language has been granted too much power."[191] In short, although the claim is that they hope to err on the side of privileging neither, matter is clearly in fashion at the moment. As Coole and Frost put it, "materialism is once more on the move after several decades in abeyance."[192]

Unlike so many material feminists, Barad readily admits that to say that language has been granted too much power is nothing new; Nietzsche long ago warned against the dangers of the prison house of language.[193] Although many engagements with the diffractive method eschew social constructivism and the linguistic turn, the rejection of language is not Barad's project. She is specifically concerned to address only the role of language *in recent theories of social constructivism that require linguistic mediation.*[194] Like Judith Butler before her, Barad attacks reductionist theories of social construction. She argues that humanist theories of social construction depend upon two mistaken assumptions that lead to the viewing of language as a mediation, first, that human individuals inhabit a realm separated from the world, and second, as separate, humans achieve the distance required to understand and act on and move in/across the world. The notion of separation is an ontological presupposition held by theories of social constructivism, and maintained by all theories of language that remain representational. It is the monolithic characterization of language as a mediating force that Barad rejects.

If material feminists hope to avoid privileging either side of the language/reality dichotomy, then they need to examine the ways in which language operates as an emergent entity itself. As Barad notes, all the puns on language mattering don't matter, but there remains a lack of theorizing about the relationship in the dichotomy language/reality. If we cannot simply read one thing through the stable frame of another, as Barad warns, then how do we understand the materiality of language and the language of matter? Material feminists usually invoke the need for the "proximity of" or "closer relation to" each side. For example, Hekman seeks to "build on their intimate interaction."[195] These metaphors of space rely on the separability principle, an ontological split between language and matter, and as Barad says, even "proximity" is too literal. If material feminists want to "bring the material back in," then we need to explore both our Newtonian assumptions about space and the metaphors we use to ground and stabilize them.

Far from sidelining language and linguistic play, then, I argue that material feminists need to engage with it more deeply, or more "real-istically." After all, the word "play" in Derridean deconstruction never meant trivial, senseless, or foolish, but rather, refers to the

---

[191] Ibid., 138. Citations in books, to name a few: Rosi Braidotti, *The Posthuman*; Jane Bennett, *Vibrant Matter*: *A Political Ecology of Things* (Durham: Duke University Press, 2010); Levi Bryant, *The Democracy of Objects*; Rebecca Coleman, *The Becoming of Bodies: Girls, Images, Experience* (Manchester: Manchester University Press, 2012); William E. Connolly, *The Fragility of Things: Self-organizing processes, Neoliberal fantasies, and Democratic Activism* (Durham: Duke University Press 2013); Richard Doyle, *Darwin's Pharmacy: Sex, Plants, and the evolution of the noosphere* (Seattle: University of Washington Press, 2011); Julia Gillen, *Digital Literacies* (Abingdon, Oxon: Routledge 2014); Harding, *Science and Social Inequality: Feminist and Postcolonial Issues*; 2012); Patricia Lather, *Engaging Science Policy*; Sarah Kember and Joanna Zylinska, *Life After New Media: Mediation as a Vital Process* (Cambridge: MIT 2015); Bjørnar Olsen, et al, *Archaeology: the discipline of things* (Berkeley: University of California Press, 2012); Amit S. Rai, *Untimely Bollywood: Globalization and India's new media assemblage* (Durham: Duke University Press, 2010); Van der Tuin and Dolphijn, *New Materialism.*

[192] Coole and Frost, *New Materialisms,* 2.

[193] Barad, *Meeting the Universe*, 133.

[194] Ibid.

[195] Hekman, *The Material of Knowledge,* 3.

serious effects of differential relations. It is precisely this notion of "play" that Barad investigates, specifically in terms of the agency these differential relations effect. "Agential realism" and the diffractive method are, in this sense, extremely committed to "play." In the next chapter, I begin to explore the role of language in the diffractive apparatus, especially as it relates to the material feminist search for a new paradigm that seeks an alternative to the binary between language and reality.

Finally, far from being a general statement about "differences mattering," Barad's diffractive approach is never messy or ambiguous. On the contrary, diffractive explorations should "make clear that entanglements are highly specific configurations…. The point is that specificity is everything."[196] Barad's aim is to be "rigorously attentive to important details of specialized arguments within a given field."[197] Diffraction entails "the processing of small but consequential differences." Diffraction apparatuses are able to detect, for example, readings of the "hyperfine" color structure in atom emissions when they jump energy levels. The diffractive method, Barad explains, "is not merely about differences, and certainly not about differences in any absolute sense, but about the entangled nature of differences that matter."[198]

Barad's language is often general and repetitive when it comes to these "differences that matter," which is why her work is easily adapted to so many varying disciplines. However, in those rare instances where Barad finally does offer specific examples, they include not only exhaustive descriptions of specific arrangements (e.g. the scanning tunneling microscope and its ability to not only see but manipulate atoms, or the life of a brittlestar) and long lists of minute details that include images or illustrations, but also eloquent expressions of her childlike excitement over the achievements of physics. For example, she delights over the ability of physicists to create machines with the ability to measure the weird quantum world. For Barad, it implies that the task of diffracting requires a comprehensive understanding, an understanding that can only be achieved through "multiple literacies across disciplines." Agential realism employs diffraction as a method for detecting just this type of "hyperfine" difference patterns, that is, real patterns that Barad says are "more like fairy tales" than measurements because they seem so *unreal.*[199] The task of detecting these difference patterns is never done from one perspective, but is always in intra-disciplinary affair, and the measurements are never "incoherent" or "ambiguous," but always "precise." In the next chapter, I take up the problem of measurement in quantum physics in order to show how the very concept of measurement is deeply embedded in the difficulty of developing alternatives to the assumptions that bind us to the dichotomy between language and reality.

Many feminist scholars hail Barad's diffractive method and claim to adopt it, but if the plan of new materialist feminists is to build similar diffractive apparatuses—in essence, serious quantum, rather than classical, analytic apparatuses—then we will need to navigate those quantum difficulties with care, in order that we do not simply repeat old optics in the name of the "new" materialism.

[196] Barad, *Meeting the Universe*, 74.
[197] Ibid., 93.
[198] Ibid., 36.
[199] Ibid., 92.

## Chapter Two
## Diffractive Differentiations

*Apparatuses are not… instruments… that magnify*
*and focus our attention on the object world, rather*
*they are* laborers *that help constitute…the phenomena being investigated.*
~Karen Barad

## Introduction

New material feminists such as Susan Hekman are building their case against linguistic constructivism. But developing a new form of realism, says Hekman, will not be easy:

> The social constructionist paradigm is pervasive and hegemonic. Furthermore, it has been politically effective for feminists, gays, lesbians, and antiracist projects. Its adherents will not abandon their position easily. My argument, however, is that we should take seriously the signs of discontent with this paradigm. Something significant is wrong here. [We] need a new way to understand the relationship between language and reality.[200]

In the previous chapter, I showed how critical theorists across disciplines, including new material feminists, have taken up Barad's diffractive method as an attempt to move away from social constructivism and its linguistic play and "bring the material back in." As I have also shown, however, many attempts to apply Barad's method merely repeat the mistakes of the linguistic turn from which they seek to escape. They perpetuate rather than reformulate its assumptions, and continue to be bound up with representationalism, individualism, and humanism.

In "Posthumanist Performativity," what Barad calls "diffractive" is the practice of reading texts "through" one another as an "intervention" that "thinks the 'social' and the 'scientific' together in an illuminating way."[201] "Illumination" here refers to the way in which diffraction patterns "light" up certain regions and allow us to "see" the indefinite (or "dark") nature of boundaries. Across disciplines, the diffractive method has come to be understood largely as a reading practice that utilizes the concept of diffraction from classical physics (as Barad outlines in her methods chapter) to register "differences that make a difference." Although Barad emphasizes the transformative power that quantum physics could hold for social theories, applications of diffractive readings tend to fall into four basic practices that comprise no specifically quantum diffractive elements. Some of these methods use diffraction explicitly as a "mere" metaphor; as such, diffraction is meant to instruct our thinking, and to maintain the complexity and dynamism of ideas. Others attempt to enlist diffraction more literally, and assume that reading is a practice that "interferes" with or "disturbs" current thinking to produce "real world" consequences. As a specifically affirmative reading practice, diffraction opposes the critical tradition characterized by debunking and suspicion, and instead attempts to avoid negative critique by offering harmonious conversation and a form of protection and care. Lastly, as an ambiguous space that ultimately defies linguistic articulation, diffractive reading seeks to blur the boundaries of its objects by showing their various connections.

---

[200] Alaimo and Hekman, *Material Feminisms*, 92.
[201] Barad in Alaimo and Hekman, *Material Feminisms*, 122.

As a "new materialist" approach, these four versions of the diffractive method attempt to "bring the material back in" to a feminist discourse influenced for the decades by linguistic constructivism, and thus renew the conversation between "science and the social." And yet each of the diffractive interventions fails to reconfigure the distinction between language and reality inherent in the representational paradigm. By maintaining the gap between matter and meaning, they offer no clearly articulated alternative to the linguistic constructivist paradigm. I also showed in the previous chapter that this failure is largely due to the fact that many readers of Barad's work have completely overlooked the difference between classical and quantum diffraction, and have unwittingly employed a merely classical model of diffraction. In various ways, each practice of diffractive reading remains bound up with precisely the presuppositions they were attempting to overcome; rather than deconstructing the binaries, diffractive methods preserve them.

Given the difficulties involved with creating the new relations between language and reality, this chapter contributes to the project of unpacking our theoretical dependence upon atomistic aspects of scientific concepts for the development of social theories. First, I develop a clearer understanding of the difference between classical and quantum modes of diffraction through two key historical moments in the discovery of quantum mechanics: the famous double-slit diffraction experiment, which proved particle-wave duality, here serves to illuminate the concepts of interference, inseparability, and superposition. Otto Stern and Walther Gerlach's cigar experiment, which revealed electron spin, also demonstrates the constitutive nature of measurement, and maps the extensions of a diffractive apparatus. It is interesting to note that both experiments achieved their proofs by means of accidental discoveries. These two experiments introduce details of the quantum concepts interference, superposition, complementarity, inseparability, and complex conjugations that are useful for distinguishing quantum characteristics from classical ones. The second part of the chapter places the diffractive method under scrutiny through the measurement problem in physics, and shows how employments of the diffractive method in the critical humanities tend to focus on the notion of entanglement or "togetherness," while they tend to ignore what I will argue is of deeply crucial importance, that is, the notion of decoherence (what Barad calls "resolution," or "cutting," and "exclusion"). Finally, I argue that methods of diffraction that organize themselves as a critical reading strategy that combines disparate elements in order to construct new meanings (togetherness-as-entanglement), are problematic for feminist critical practice for a couple of reasons. First, their "positive" critique privileges entanglement at the expense of decoherence. Quantum diffractive methods would have to account for both. Second, they tend to erase rather than account for constructions of meaning. Using Barad's own terminology, I would argue that classically diffractive methods are fundamentally representationalist, humanist, and individualist. More specifically, in classically diffractive methods, cognition and agency are condensed in the human subject, and representations operate as the ground of knowledge, since the material practices of their production are erased rather than accounted for.

Quantum diffraction, I want to suggest, operates by a completely different logic, and is therefore composed of an entirely different set of practices. A specifically quantum diffractive method, I argue, is a genealogical practice "at the next level up," that is, a precise account of the exclusionary practices that operate to produce intelligibility. Furthermore, as a method, quantum diffraction, therefore, is not simply a representational or interpretive practice of critique. Rather, as a genealogical endeavor, quantum diffraction, as I outline it here and in the following chapters, offers a detailed account of the constitutive role of those very representational practices

embedded in a wider set of material practices. These include the role of language. In short, I argue that material feminists who seek to theorize a new relation between language and reality have skipped a step; jumping from the representation to the thing, there is no accounting for how those representations operate under the radar. Slowing down then, I go back and unpack the ground upon which those very images are built. Until this genealogy is attempted, we cannot begin the Herculean task of transforming our social theories using "quantum" means and methods. Furthermore, as particularly quantum, these methods will be tied up intimately with the problematic nature of quantum measurements. In the next chapter, our conclusions about measurement will tie back into an entirely new role for writing and the book which will offer different methods of critique for feminist theory and practice.

## The Experiments

The application of the diffractive method across disciplines in the humanities has entirely neglected to distinguish between the classical and quantum models of diffraction. That said, the concept of quantum diffraction is extremely complicated—so complicated, in fact, that Barad offers no description of it. In her brief chapter on method, Barad details only the classical operations of diffractive wave behavior. She wraps up her methods chapter with a concession: it will take the rest of the book to understand the counterintuitive notion of quantum diffraction, but even so, she will only hint as to what a positive account of quantum diffraction is.[202] In lieu of a clear explanation of quantum diffraction, she cites Nobel prize winning theoretical physicist Richard Feynman, who insists that quantum mechanics is a phenomenon that is "absolutely impossible" to explain in any classical way.[203] The two modes are "impossibly different," Feynman says. There are corroborators to his claim; Dutch physicist, Hans Kramers, who worked with Niels Bohr, says, "the principle of [quantum] superposition has no analogy in classical physics." According to English physicist Paul Dirac, "the superposition that occurs in quantum mechanics is of an essentially different nature from any occurring in the classical theory."[204] Barad denies that she uses diffraction as metaphor taken from classical diffraction, and claims that her method is "diffraction at the next level up." But she never explicitly connects this "next level up" with the quantum version of the method. Social theories, she argues, could be transformed by shifting form the classical to the quantum model. Barad's "quantum leap" is only implied. And as far as I know, a quantum method of diffraction has yet to be articulated by anyone else.[205] What I want to emphasize here is not simply that an interpretation of Barad's quantum diffractive method has yet to be made manifest—either by her or her readers/interpreters—but also and more importantly, that any quantum method of diffraction has no analogue in classical physics. Being "impossibly different" from one another, their methodological counterparts would also be completely different in nature. This chapter begins

[202] Barad, *Meeting the Universe,* 81.
[203] Richard Feynman*, The Feynman Lectures on Physics.*
[204] Paul Dirac, *The Principles of Quantum Mechanics*: *Fourth Edition* (Oxford: Clarendon Press, 1967). Interestingly, Dirac was the only associate and follower of Bohr's Copenhagen interpretation who thought that the question of interpretation was "a pointless preoccupation." See Manjit Kumar, *Quantum: Einstein, Bohr, and the Great Debate about the Nature of Reality* (New York: Norton, 2008): 277.
[205] While the distinction between classical and quantum diffraction is mentioned by Van der Tuin, "Reading Diffractive Reading: where and when does diffraction happen?" *Journal of Electronic Publishing* 19.2 (2016) and Dorothea Olkowski, "The Cogito and the Limits of Neo-materialism and Naturalized Objectivity." *Rhizomes: Cultural Studies in Emerging Knowledge* 30 (2016), diffraction is nevertheless talked about in terms of classical physics.

the process of outlining characteristics of quantum weirdness as a way to expand our current understandings of diffraction as a method.

The challenge presented by this relation of "impossibility" must certainly explain the lack of quantum methods available for material feminism. It may also imply that my efforts to bring a quantum diffraction method into being are naïve and doomed to fail. However, if it is impossible to give an explanation of quantum diffraction in classical terms, this chapter will attempt to sketch the outlines of one by an oblique route. I propose that by exploring two quantum scientific experiments from the early twentieth century and their accidental findings that contributed to the development of quantum mechanics, we can shed light on a number of quantum concepts that undergird them. Barad elegantly describes these and many other experiments in order to outline her theory of agential realism. My approach is also to outline them, albeit negatively: even if getting a handle on a few quantum concepts, such as superposition, interference, non-separability, entanglement, complementarity, and conjugation, will not allow us to say definitively what quantum diffraction *is*, at least we might say what it *is not*. And while an entirely negative description may seem wholly inadequate, I am heartened by the fact that a negative idea of superposition is all physicists have to work with too.[206] Approaching the problem from the negative side has the benefit of creating some precision around these quantum concepts and how they might be applied to the diffractive method, but it will also contribute positively to the new material feminist project of theorizing new relations between language and reality.

## The Double-Slit Experiment

Classical diffraction occurs when waves of any kind exist in a state of superposition. In classical diffraction, the principle of superpositioned waves states that two or more waves passing through the same medium at the same time pass through each other (diffract) and interfere (overlap) either constructively or destructively. Imagine a small dingy tied up at a dock in a harbor. Imagine, too, a slowing yacht passing through, its bow cutting through the water, sending waves out along the entire length of the hull. As it passes, the dinghy dips and bobs as the long waves from the larger boat diffract around the smaller one. Diffracting waves bend around corners and spread out, producing a ripple effect. This overlapping and combining action applies to all waves, both two- and three-dimensional ones: sound, radio, water, and light waves. Before the 1920s, only waves were thought to operate by superpositioning. Since it is impossible for two separate particles or atoms to exist in the same place at the same time, it was assumed that matter cannot exist in superposition. The belief in separate particles has been key to classical physics, and is the basis of individualism. Individualism presupposes that entities or atoms, which are inherently separate (literally, "un-cuttable"), and move around in a separate space or "void," understood simply as "nothing."[207] By nature, atoms remain unchangeable, having an internal essence or substance as well as determinate boundaries and properties, and they remain separate from the void. Unable to fuse or change, atoms move about in the void, colliding with one another and combining into clusters. The key to individualism is the principle of separability: matter, particles, entities, or individuals cannot inhabit the same place at the same time.

The belief in the separability of entities was challenged in 1925 when Clinton Davisson (1881–1958) and Lester Germer (1896–1971) accidently discovered direct evidence for the wave

[206] Albert, *Quantum Mechanics and Experience*, 14.
[207] Barad, *Meeting the Universe*, 3.

behavior of matter.[208] Under the right experimental circumstances, they found, matter manifests wave behavior. Originally, Davisson and Germer set out to study electron bombardment (directing the laser beam of electrons at the surface of a nickel crystal to see how many bounced off and at what angles; they expected diffusion to occur due to the small size of the electrons and the smoothness of the crystal). When air accidently entered the vacuum chamber, oxide formed on the nickel. They used heat to de-oxidize the nickel, which generated an unexpected diffraction pattern. The accidental results of their experiment proved Louis de Broglie's 1924 hypothesis that particles of matter have wave-like properties.[209] Their discovery set off a flurry of controversy, which proved extremely productive for elaborating quantum theory.

Based on Davisson and Germer's original experiment, the modern double-slit diffraction experiment looks like the following: when a laser gun shoots a laser through two vertical slits cut out of a wall, the waves of light show up on a back screen in the form of an interference pattern. Interference patterns have multiple bands, alternating light and dark, with the brightest band in the middle, and the lightest bands at the edges: a diffraction pattern. Interference patterns always indicate wave behavior. When pellets are shot from a gun through the two vertical slits, they hit the screen behind the wall to leave a different pattern, that of two bright bands (or "double band" pattern), which reflect the shape of the slits. No interference pattern appears with pellets. Both of these outcomes—where light waves produce an interference pattern and matter does not—are what scientists expect to see. However, when these "pellets" are scaled down to quantum size and electrons are shot through the same two slits in the wall, the normal double band pattern does not appear. Instead, what shows up is an interference pattern. At the quantum level, matter acts like a wave.

In classical physics, when two waves meet, they combine and either amplify or attenuate. But quantum superposition does not imply an increase or decrease of magnitude in the same way. In fact, everything that is puzzling about quantum mechanics can be said to come from this very different idea of quantum superposition.[210] It is the concept that most strikingly distinguishes the classical world from the quantum one.

When Davisson and Germer first discovered that particles were acting like waves, it was unclear as to why they acted that way. In 1926 Max Born (1882–1970) theorized that a wave is a "probability profile" for a particle. Erwin Schrodinger (1887–1961) confirmed Born's theory with a mathematical equation, stating that each "particle" is represented by a wave function $\Psi$ (position, time), such that $\Psi^2$ equals the probability of finding the particle at that position at that time. In repeated tests, the mapped particle appeared exactly according to the probabilities, indicating agreement between the experiment, the theory, and the math. For physicists, this agreement in all areas is sufficient verification that the theory is correct.[211]

In terms of the particles shooting through the double-slit, then, the particle looks like a wave because it is "really" a probability wave; hitting the barrier of the wall, it travels through the slit and lands on the back screen to form the familiar interference pattern of light and dark stripes. Each material "hit" represents one location on the probability wave function. The

---

[208] C.J. Davisson and L.H. Germer, "Reflection of Electrons by a Crystal of Nickel." *Proceedings of the National Academy of Sciences USA*. 1928 April; 14(4): 317-322. Barad also discusses their experiment, *Meeting the Universe*, 82-3.

[209] Nouredine Zettili. *Quantum Mechanics: Concepts and Applications* (West Sussex: John Wiley & Sons, 2009): 18-20.

[210] Albert, *Quantum Mechanics and Experience,* 50.

[211] Pauling, Linus, and Edgar Bright Wilson, *Introduction to Quantum Mechanics: With Applications to Chemistry* (New York: Dover, 2011); Albert, *Quantum Mechanics and Experience*.

"scattering" of the electron, or the varying locations of its landing sites, maps directly onto its probability function. This seems to account for how matter could produce an interference pattern: the quantum principle of superposition states that *any* given physical system simultaneously holds *all* of its possible states at once; it is indeterminate until a measurement localizes or determines it.[212]

To review, classical diffraction says that two waves, each in a determinate state, overlap or "interfere" with each other. In classical physics, interference is conceived of as a disturbance, the result of which is a combining effect; the interaction of two waves produces an incumbent change to them both in which they either become bigger or smaller, and definitively so. But quantum and classical diffraction are "of two natures," as we know. In the quantum superposition experiment, the electrons were not sent through the slit together, but only one at a time, so there is no disturbance in the combining of waves. However, each electron that went through the slit "took its place," so to speak, on the interference pattern, indicating that the electrons are "actually" waves with a probability profile. Lacking a single determined position, these particles are understood as being both everywhere and nowhere at once. Therefore, predictions about where each electron will land can be made, but only probabilistically. In quantum interference, there is a lack of determinacy; a single location only appears upon measurement. In other words, we can only reconcile the wave-like and particle-like properties statistically; it is impossible to render an "actual" individual particle.

At this point, we can make a basic distinction between the classical and quantum versions of diffraction based on the concept of superposition: indeterminacy. Whereas classical diffraction engages with determinate objects that produce absolute measures, quantum diffraction engages only with a probability profile; its determined state is only statistical until actually measured. "Superpositions are not a simple multiplicity, not a simple overlaying or a mere contradiction."[213] According to philosopher of physics, David Z. Albert, quantum superpositions "are extraordinarily mysterious situations."[214]

The results of Davisson and Germer's original experiment become even more mysterious when physicists ask how the probability profile (the wave) transforms into one determined location (the particle). If the particle as understood to be "really" a wave and superpositioned like one, then it should also be "spread out" in different locations at once, like a wave. However, when the particle is measured, it is always only found in a single location. This suggests that a particle is not the same as a wave, but that rather, it "becomes" one from a wave state. In other words, it seems that the *measurement* is what has "interfered" with the particle's probability. Remember that in the experiment, only one electron at a time is sent through the slit, so it is not interfering with another electron. It seems, rather, that the measurement itself has "spiked" the probability and *caused* the particle to land in a particular location.[215] In other words, the electron is not interfering with other electrons, but with the measurement apparatus itself. It has been repeatedly shown that *any* given physical system simultaneously holds *all* of its possible states, and no single outcome exists until it is observed. Quantum indeterminacy is the normal state of

[212] Emmanuel Haven and Andrei Khrennikov, *Quantum Social Science* (Cambridge: Cambridge University Press, 2013): 90-92.
[213] Barad, "Cutting Together-Apart," 176.
[214] Albert, *Quantum Mechanics and Experience*, 11.
[215] See Martin Bojowald, *The Universe: A View from Classical and Quantum Gravity* (Weinheim, Germany: Wiley-VCH) 2013.

systems, and only a measurement interferes to create determinacy. Measurement seems to be the crucial factor in what is called the "dropping" or "collapsing" of a wave into a particle.

The second difference between classical and quantum physics, then, is the situation of interference. In classical physics, waves interfere with and disturb each other, altering their combined amplification, but they remain waves. In quantum interference, the measurement interferes with the wave and it collapses into a particle.

Einstein famously had great difficulty in accepting this emerging interpretation of quantum postulate, which gave such agency to human measurements. He and his colleagues refused to accept the possibility of the constitutive nature of measurement for quantum mechanics associated with the Copenhagen interpretation. Einstein stubbornly refuted Bohr's interpretation at every turn, famously claiming that, "God does not play dice with the universe." Throughout the 1920s, he completely rejected Bohr's notion of probability, arguing that it is completely opposed to Newton's law of causality. The problem for Einstein lies with the very juxtaposition of particles and waves. In his 1935 paper written together with Boris Podolsky and Nathan Rosen (now known as the EPR paper), Einstein refuted the Copenhagen interpretation by claiming that the inability to account for both waves and particles at the same time means that the theory is incomplete. The universe requires separability, Einstein said, and "the mutually independent existence of spatially distant things."[216] Einstein's Nobel Prize winning paper of 1905 made the provocative suggestion that light also consists of localized particles; like matter, photons, too, are discrete quanta of energy.[217] Einstein's paper points to the absurdity of the notion that a wave function—of light or matter—could "collapse" solely by means of human intervention in the form of a measurement.[218] The Copenhagen interpretation of quantum mechanics, Einstein said later, is "a little system of delusions."[219]

In 1933, Einstein finally admitted that the probabilistic interpretation was logically true; nevertheless, he still has this to say: "I cannot but confess that I attach only a transitory importance to this interpretation. I still believe in the possibility of a model of reality—that is to say, of a theory which represents things themselves and not merely the probability of their occurrence."[220] Neither Bohr nor Einstein delivered a report at the fifth conference at Solvay in 1927, but their great "duel" fuels everyone's memory of it.[221] The great debate between Bohr and Einstein centered on the nature of reality. Einstein believed in the possibility of representing the "things themselves." But Bohr insisted that, "there is no quantum world. There is only an abstract quantum mechanical description."[222]

---

[216] Albert Einstein, Boris Podolsky, and Nathan Rosen, "Can Quantum-mechanical Description of Reality Be Considered Complete?" *Physics Review* 47, 1935.

[217] Einstein's "miracle" papers on the photoelectric effect: "On a Heuristic Viewpoint Concerning the Production and Transformation of Light." "The Revolutionary Quantum Paper," *Einstein 1905*. See John S. Ridgen, *Einstein 1905: The Standard of Greatness* (Cambridge: Harvard University Press, 2005): 26-28.

[218] This is precisely the position taken today by the Ghirardi-Rimini-Weber (GRW) approach to the measurement problem. Any measurement may effect its environment, but could not be significant enough to determine aspects of the universe.

[219] Quoted letter from Einstein to D. Lipkin, July 5, 1952, Einstein archives. See Arthur Fine, *The Shaky Game: Einstein, Realism and the Quantum Theory* (Chicago: University of Chicago Press, 1997).

[220] Quoted in Dipanker Home and Andrew Whitaker, *Einstein's Struggles with Quantum Theory: A Reappraisal* (New York: Springer, 2007):170.

[221] Kumar, *Quantum: Einstein, Bohr, and the Great Debate,* 274.

[222] Bohr quoted in Paul McEvoy, *Niels Bohr: Reflections on Subject and Object. The Theory of Interacting Systems Volume 1* (San Francisco: Microanalytix, 2001), 135.

While Einstein clung to the realist idea that the world "out there" had to exist even when we weren't looking, Bohr denies its independent existence, and attributes its dependent existence to the specific configurations of the experimental apparatus. As Barad restates Bohr's theory: "the necessary condition for resolving indeterminacy is the existence of a specific measurement apparatus."[223] Quantum superposition is the strange situation that implies the electron is both here and there, as well as not here and not there, and also neither of those two. It is all of them (and none of them) at the same time, *until an observation is made.*[224]

The meaning of "interference" for classical versus quantum physics is also distinguished. No longer a simple combination of pre-existing things measurable without interruption, interference at the quantum level necessarily involves all the various tools of measurement. Unlike classical interference, quantum interference is not a "disturbance" that can simply be subtracted out after the fact, leaving the "pre-given" entities in tact.

Quantum measurements have no predetermined objects, values, or corresponding visible, knowable, or articulable physicality. The terminology to which we have become accustomed does not correspond to what we call "reality;" rather, objects are, as Barad points out, semantically and ontologically emergent with their measurements.[225] Following inseparability, there is no distance from which to view objects objectively; rather objectivity is redefined as "externality within." Quantum diffraction involves a situation of superposition without the combining effects of pregiven and measurable elements; instead it involves the indeterminacy and probabilities. Quantum diffraction has no representational terminology that corresponds to the physical world, but is semantically and ontologically emergent with the measurement apparatus. Hence, our attention must be adjusted from representational terminology to complex conjugations of symbols involved in any given measurement apparatus.

When it comes to quantum diffraction, measurements are always crucial to the emergent existence of things, and as Bohr pointed out, symbols are a key part of those measurement apparatuses. The idea that human concepts and language affect our worldview is not new (an epistemological question); the idea that language can actually bring things into existence has been controversial since the ancient Greeks.[226] Words have power, but as Einstein insisted, "God doesn't play dice." An ontological question thus surrounds the notion that language might be powerful enough to affect the whole composition of the universe; Einstein found this assertion to be absurd.[227] The difficulty in quantum diffraction lies here, in the measurement problem: if the

---

[223] For a discussion of the distinction between indeterminacy and uncertainty, see Barad, *Meeting the Universe*, 295-302; Alfred Landé, *New Foundations of Quantum Mechanics* (Cambridge: Cambridge University Press, 2015); Michel Bitbol, *Schrödinger's Philosophy of Quantum Mechanics* (Dordrecht: Kluwer Academic Publishers, 2012).
[224] Albert, *Quantum Mechanics and Experience*, 21.
[225] Barad, *Meeting the Universe*, 118.
[226] I'm thinking here of Gorgias's "Encomium of Helen," in which "speech is a powerful master and achieves the most divine feats," but also Socrates' critique of sophists "who make small things seem great and great things seem small by the power of their words." and Socrates' warning about the risks involved in rhetorical teachings which cannot be returned like food and drink after you "buy," i.e., "ingest" them. See Gorgias, *Encomium of Helen*, Translated by D.M. MacDowell (Bristol: Bristol Classical, 2005); Plato, *Phaedrus*, Translated by Alexander Nehemas and Paul Woodruff, (Indianapolis: Hackett, 1995): [267a-b]) and *Gorgias, Menexenus, Protagoras*, Translated by Malcolm Schofield and Tom Griffith, (Cambridge: Cambridge University Press, 2010): [314b]).
[227] "God doesn't play dice," is one of Einstein's most famous sayings; it was written in a letter to Max Born, and is often mistaken as a confirmation of his belief in God. Einstein used the phrase more than once to refer to the fact that "gods don't intervene" on the universe: it follows stable natural laws. Albert Einstein, Max Born, and Hedwig Born, *The Born-Einstein Letters: Correspondence between Max and Hedwig Born from 191601955, with commentaries* (New York: Walker and Co., 1971).

universe is composed of laws in which particles have properties like position, velocity, and mass, then what accounts for the fact that in repeated experiments particles do collapse upon being measured, every time? Physicists want to know, *why is this happening?*

## The Measurement Problem in Physics

Einstein wasn't alone in his confusion about the question of resolving indeterminacy through measurement. And nearly a century later, physicists still don't know what causes a particle to leave its superpositioned state and "drop" or "collapse" into one local position. This discrepancy between the particle-as-wave and the particle-as-location is what modern quantum mechanics calls the "Measurement Problem." Today, there is still no mathematical equation or corresponding experiment that can confirm what makes the particle drop into a location, in other words, what causes a "wave" to become "matter." So although the role of human measurement in quantum physics has been deemed by all physicists as absolutely integral for understanding the universe, no one agrees on precisely *how* this is the case.

Historically, there are at least four basic responses to the measurement problem. Each of the four approaches leads to a difficulty, an impasse.[228] The first approach to the measurement problem in physics tries to restore a more concrete reality to the quantum world. Called the "pilot-wave" theory, or De Broglie-Bohmian theory, named after Louis de Broglie (1892-1987) and David Bohm (1917-1992), waves and particles still are understood to be separate entities; particles are defined as something with a position, while waves are defined as the particle's probability or "guiding" trajectory relevant to its motion. With this guiding force to particles, the movement of particles conforms to what can be viewed with instrumentation. In the De Broglie-Bohmian theory, collapse is viewed as the force of a wave pushing a particle to land in a particular location. The key to this approach is that the wave and particle are two separate entities, defined by what they do and what can be measured of them: wave probability and particle location.

The Many Worlds approach, originally formulated by Hugh Everett in 1957, is a formalist one, which simply refuses the notion of collapse altogether. There is no collapse, this view argues, and no final position of the particle, thus, there is no measurement problem at all.[229] What exists is only the probability of the wave. It is our measuring devices that pinpoint a position for the particle, but a measurement only references our subjective view of the universe. Particles only seem to exist because of the tools we use to see them; really there are only waves.

The Many Worlds interpretation of reality gets stranger because it also posits not only a single unfolding history, but a branching one in which every possible outcome of the wave is real. If the universe is fundamentally composed of waves, that is, of probabilities, then all probabilities exist and many worlds unfold at once. Our subjective, measured view of this world (the collapse) is the one that exists for us, but all the others are still "out there," left unmeasured. We simply have no access to those infinite others.[230]

---

[228] Each of the four approaches also requires a choice between realism and anti-realism: either a pre-existing universe exists "out there" and awaits our measurements (positivism/realism) or that world is constructed by means of our very limited human measurements (subjectivism/anti-realism). I will address Barad's critique of this, but it is worth noting that Cary Wolfe argues that these two are really two sides of one coin, since both are forms of idealism.

[229] See David Wallace, *The Emergent Multiverse: Quantum Theory according to Everett Interpretation* (Oxford: Oxford University Press, 2014).

[230] Ney and Albert, *The Wave Function: Essays on Quantum Mechanics.*

The third answer to the measurement problem, the Ghirardi-Rimini-Weber (GRW) or "collapse theory," says that groups of particles behave in a statistically regular way and their collapses happen probabilistically. Similar to the Many Worlds approach, the math suggests that subatomic particles exist in a state of superposition, while the measured results only ever give us one state.[231] But the GRW approach attempts to reconcile the math with the measure in order to avoid the idea that human measurement is some sort of special action affecting the quantum universe. GRW allows that because the large number of particles are entangled with the measuring device, they do collapse when measured, but also insists that the collapse is not significant for understanding the state of the universe. It is significant to note that all three of these approaches to the "collapse" of a particle in a location share a belief in realism, wherein reality is ultimately composed of waves.[232]

The last, and perhaps most controversial approach to the measurement problem, Quantum-Bayesianism or "QBism" (pronounced like "cubism"), finds the realism of the other approaches problematic.[233] According to QBism, wave function doesn't belong to "nature itself," nor does it completely describe the state of a physical system in the world. The probability of waves is formalist rather than realist. According to QBist physicist from Columbia University, Christopher Fuchs, the wave function's probabilities are "subjective degrees of belief about the system." He goes so far as to say that "probability doesn't exist…it will go the way of fairies and elves."[234] The wave function describes the observer, not the world. "Quantum mechanics," Fuchs says, "is a law of thought." What is called the wave function's "collapse," according QBism, is simply a reflection of the observer's new beliefs after making a measurement (e.g., the particle's drop violates the continuous and unitary Schrodinger equation; thus the observer must adjust her belief to the new information). QBists claim that once physicists accept their role in creating an understanding of the universe, the so-called "measurement problem" (as well as other conundrums) in physics will simply disappear.

QBism dares to present the measurement problem as a false problem. Others have weighed in on the type of problem that measurement might be for quantum physics. For example, mathematician, John von Neumann (1903-1957), who is perhaps better known today for his work on the Manhattan Project, questioned the measurement problem in a different way than most. If, von Neumann proposed, "when no measurements are going on, the states of all physical systems invariably evolve in accordance with the dynamical equations of motion," and "when there are measurements going on, the states of the measured systems evolve in accordance with the postulate of collapse" then we could say that the measurement "causes" the particle to collapse.[235] And that is indeed what seems to be happening. But Von Neumann goes on: this "discrepancy" is entirely based upon what is meant by the word "measurement."[236] It is

---

[231] Ney and Albert, *The Wave Function: Essays on Quantum Mechanics*, 35.

[232] James Evans and Alan S. Thorndike, *Quantum Mechanics at the Crossroads: New Perspectives from History, Philosophy, and Physics* (Springer, 2007). Also see Arkady Plotnitsky, *The Principles of Quantum Theory from Planck's Quanta to the Higgs Boson: The Nature of Quantum Reality and the Spirit of Copenhagen* (Springer, 2016).

[233] Hans Christain von Baeyer, *QBism: The Future of Quantum Physics* (Cambridge: Harvard University Press, 2016).

[234] Christopher Fuchs, "A Private View of Quantum Reality." Interview by Amanda Gefter. *Wired Magazine* (June 14, 2015), and "Q2: Interview with Professor Christopher Fuchs," *Project Q: Peace and Security in a Quantum Age*. https://projectqsydney.com/portfolio/interview-christopher-a-fuchs/

[235] Albert, *Quantum Mechanics and Experience*, 81.

[236] Paul R. Halmos, "Von Neumann on Measure and Ergodic Theory," *Bulletin of the American Mathematical Society* 64 (3, part 2): 1958.

*the concept of measurement itself* that needs developing, he said, since *it has no adequate meaning in ordinary language*. Although he won the Bôcher Memorial Prize in 1938 for his work on measure theory, Von Neumann never pursued the question of meaning and measurement.

Barad does explore the nature of matter and meaning, and it is she who helps us through the measurement problem, at least initially. Although she provides little background or discussion on the measurement problem in physics, she does weigh in. Her approach is distinctive, however, because she does not address the problem of physics, but rather the more common problem of "realism." Agential realism, she proposes, would apply just as much to physics as to other sciences, as well as to feminism and social science, critical theory and philosophy. Agential realism, she says, is neither realist nor anti-realist, but "agentially realist." She insists that the controversy over the debate between realism and anti-realism is a red herring. On the one hand, there is no objective reality, or "pure nature," out there, waiting to be measured. For this reason, Quentin Meillassoux's now well-known problem of trying to think a world as it is "in itself" separate from human cognition (or de-correlated from a subject) is fundamentally at odds with Barad's project. There are no "primary qualities" (or a really real nature) that can be separated from "secondary qualities." In this regard, I imagine Barad would agree with Steven Shaviro's critique of Meillassoux (and Ray Brassier) that it is deeply anthropocentric to think that humans are the only forms of matter that have value, meaning, vitality.[237]

For example, STM images of atoms do not "prove" the reality of atoms; rather, Barad says, they are "just one more piece of evidence in a web of practices that produce what we take to be evidence."[238] On the other hand, there is also no "pure culture" either, no subjective reality composed of our collective measurements. Barad presents a case that counters both Einstein's realism and what has previously been understood as Bohr's anti-realism. Neither is correct on this count, argues Barad.[239] In fact, she says, there are a wide range of responses outside a simple dichotomy between realists who believe in objectivity and anti-realists who reject it in favor of subjectivity or epistemological relativism. Agential realism is her contribution to thinking about the composition of measurement itself. Barad says that

> … devices don't disclose preexisting values but rather it is the specific material configuration that gives definition to the notion of the property in question, enacts a cut between the "object" and the "measuring instrument,"… which is not to say that human observers determine the results, the data doesn't come out however we want, but rather, the specific nature of the material arrangement of the apparatus is responsible for the specifics of the enactment of the cut.[240]

Barad intervenes in the dichotomy between realism and anti-realism by means of her diffractive apparatus. Taken from Foucault's notion of the *dispositif* or discursive apparatus, Barad develops agential realism in order, she says, to move away from the inscription metaphors that continue to

[237] See Quentin Meillassoux, *After finitude: An essay on the necessity of contingency* (New York: Bloomsbury Publishing, 2010) and Steven Shaviro, *The Universe of Things* (Minneapolis: University of Minnesota Press, 2014).
[238] Barad, *Meeting the Universe*, 53.
[239] Ibid., 321.
[240] Ibid., 264.

proliferate in theories of the body.[241] The discursive apparatus employs the inscription metaphor, which perpetuates representationalism and individualism. Barad's diffractive apparatus doesn't act *on* bodies, but rather, changes the very relation between acts and bodies by means of an intervening measurement that cannot be understood as a disturbance. This designates a metaphysical shift, for the intra-action of bodies, acts, and apparatuses of knowing signifies the mutual constitution of all entangled agencies.[242]

Measurement is not the only understanding that her agential realism changes. Causality and objectivity are also understood differently. No longer limited to a humanist conception of embodied cognition, Barad's posthuman performativity defines intelligibility as differential responsiveness that endows all entities (not merely human ones) with agency. Having lost its role as disturbance, measurement cannot be thought of as directly causal; rather, its agency is dispersed across the entire apparatus. Measurements do not "by themselves" produce cuts or separate entities; rather, "states are agentially separated within the phenomenon" by means of an "exterior within."[243] In other words, measurement cannot be reduced to a disturbance originating "outside," but is itself part of the intra-acting material arrangement that produces the emergence of distinct entities.

Individuation is the result of this process whereby, "specific intra-actions…entail the larger material arrangement."[244] This arrangement, Barad argues, is what we call "objectivity," it is an enactment derived from a wider set of practices that—importantly for our concerns—includes concepts and language. Not even space, time and matter "exist prior to the intra-actions that reconstitute entanglements." Objectivity, for Barad, "is premised on an agential (or enacted) ontological separability…rather than an absolute notion of externality."[245] Measurement is what "interferes" with, but does not disturb, phenomena; it is the condition of possibility for the emergence of distinct entities.

Barad understands measurement to be dispersed in a wider ecology of practices, but just how far does the measuring apparatus extend? The Stern-Gerlach "cigar experiment" demonstrates that the apparatus is not limited to purely "scientific" or laboratory objects, but instead, has a reach that extends far beyond typical scientific tools. The quantum apparatus sees no pregiven distinction between science and the social, thus complicating the question of where a given apparent "ends." The cigar experiment therefore also shows that any assessment of "boundaries" requires what Barad calls "hyperfine precision."[246]

## A Story about Cheap Cigars

The Stern-Gerlach experiment, now known simply as "the cigar experiment," was performed in Germany in 1922. It as one of many experiments in the early 1920's that tested Bohr's hypothesis of space quantization; the electron appeared to follow separate orbits of around the nucleus, but could "jump" to another one.[247] Otto Stern (1888-1969) and Walther

---

[241] For more on the inscription metaphor as defining bodies, see Elizabeth Grosz, *Volatile Bodies: Toward a Corporeal Feminism* (Bloomington: Indiana University Press, 1994).
[242] Barad, *Meeting the Universe*, 33.
[243] Ibid., 346.
[244] Ibid., 321.
[245] Ibid., 74.
[246] Barad insinuates that "hyperfine precision" involves traditional notions of precision, but also a "fantastic" element.
[247] Guilaniano Benenti, Guilio Casati, and Guilinao Strini, *Principles of Quantum Computation and Information, Volume 1 Basic Concepts* (London: World Scientific, 2004): 50-53.

Gerlach (1889-1979) used magnetism to experiment with the orbiting electron. Gerlach thought the electron should produce a tiny magnetic field, which would provide a "handle" for manipulating the atom. He went to Stern to build his magnetic apparatus. The idea was straightforward, but its practical realization was a complex and tedious matter. Stories from the lab reveal intricate details, performed repeatedly, despite the difficulties of heating the silver, maintaining the vacuum for hours, sealing off the pumps, keeping everything from burning up. The success of the experiment depended on so many factors, not the least of which was Gerlach's tenacity and skills, but as it turns out, also other unexpected things that helped to orient the development quantum physics.[248]

Stern was an assistant professor who didn't make much money; he could only afford cheap cigars, which contained a high sulfur content. One morning as Stern inspected a slide after smoking one of these cigars, the sulfur exhaled from his mouth turned the nearly invisible traces of silver into black sulfide marks that were clearly readable by the scientists. Only the sulfur from a cheap cigar—which was not originally a part of the experiment—could produce this registering of residue. The "smoke screen," as Barad calls it, was shown to be a significant part of the experimental apparatus.[249] We should not understand apparatuses to be a static set-up in the laboratory, she argues, but rather, they are a "dynamic set of open-ended practices, iteratively refined and reconfigured."[250]

Apparatuses do not rely on divisions that we take for granted, for example, the normalized difference between the science (the laboratory experiment) and the social (Stern's class and gender). Rather, these "are the practices through which these divisions are constituted."[251] The sulfur in Stern's cigar is just one of many elements in the complex conjugation of emergence of things:

> Not any cigar will do. Indeed, the cigar is a 'condensation'—a 'nodal point,' as it were—of the workings of other apparatuses, including class, nationalism, economics, and gender, all of which are part of this Stern-Gerlach apparatus.[252]

In other words, Barad argues that Stern's gendered and classed performance of masculinity (a cheap cigar) "mattered," that is, it was part of the extended measurement apparatus that "interfered" with the phenomena to produce distinct entities—both black traces of sulfide and Stern's class and gender. It is not that there are leaks in the system, she goes on to say, where gender and class seep through to "interfere" with science. It is not necessary to try "to stop up the leaky boundary between social and scientific elements,"[253] since there is no "original" boundary to return to.

Furthermore, apparatuses do not provide a distant view of phenomena. They themselves are part of phenomena, always entangled within a larger field: "Apparatuses are not … objects sitting on a shelf waiting to serve a particular purpose…" They do not preexist, but must be built. No object or agency of observation can ever be understood to exist independently. Even our concepts, like notions of space and time, for example, must be built as well. Nothing is simply

[248] Barad discusses this experiment, *Meeting the Universe*, 162-3. See also Gennaro Auletta, Mauro Fortunato, and Giorgio Parisi, *Quantum Mechanics* (Cambridge: Cambridge University Press, 2009).
[249] Stern and Gerlach turned out to be wrong; they had no idea it was actually electron spin they had discovered.
[250] Barad, *Meeting the Universe*, 167.
[251] Ibid., 169.
[252] Ibid., 167.
[253] Ibid., 168.

"there for the taking." It is not merely things, but intelligibility that is constituted through apparatuses.[254] We can take *nothing* for granted, Barad says, because "apparatuses are constituted through particular practices that are perpetually open to rearrangements, rearticulations, and other reworkings."[255] In other words, our very intelligibility is constructed through a material set of practices and the extended hyperfine elements that constitute any given measuring apparatus at a given time.

The serendipitous "cigar experiment" dramatizes the thickly layered and intricately woven processes of resolution out of which any "entity" is cut, and the seemingly non-exhaustive list of elements that constitute them. There is therefore, the necessity of precision when it comes to attending to the boundary-making cuts in phenomena between objects and their agencies of observation. The experiment also demonstrates the incumbent blind spots involved in any diffractive analysis. Stern's cigar demonstrates the elegant conceptual simplicity of quantum physics, according to chemists Bertislav Friedrich and Dudley Herschbach,[256] but Barad's point demonstrates just how far the elements of a given iteration of an experimental apparatus can extend. It is not merely physical things that bound up with the apparatus, but all "entities" that contribute to intelligibility.

The Stern-Gerlach experiment demonstrates the way in which "entities" such as sulfur, class, and masculinity are caught up in the apparatus and contribute to its measuring activities. Likewise, representations contribute to the measuring apparatus. Bohr's interpretation of the two-slit diffraction experiments helped to sort out this paradox of "quantum weirdness" in which matter is understood to be "acting like" a wave and allowed Bohr to entirely avoid the rhetoric of collapse in the measurement problem.[257] Determinate objects are essentially fictional products of classical physics, Bohr suggested, objects that are inspired by the belief in atoms moving around in a void. This belief is constantly reinforced by the limits of grammar. According to Bohr, the names "wave" and "particle" have no significance in quantum mechanics. To say that particles are "acting like waves" is to use an analogy. But the problem is not the analogy *per se*; these idealizations, as Bohr called them, like analogies or symbols, are necessary descriptive tools in quantum mechanics. Bohr's concern with using the terms "particle" and "wave" lies at the level of reality itself. On the one hand, we simply cannot assign properties to "quantum objects," Bohr argued, since the grammar of objects with properties implies a static, isolated existence, separate properties and locations, which is precisely what probabilistic quantum objects do not have. It is impossible, he insists, to make "any sharp separation between the behavior of atomic objects and the interaction with the measuring instruments which serve to define the conditions under which the [observable] phenomena appear."[258] Grammar, the structure of predicates, and rhetorical devices such as analogies contribute to the emergence of "things," but not in a directly causal sense; rather they are part of the intra-active conditions and the dispersed agency under which observable phenomena appear.

---

[254] Barad, "Posthuman Performativity."
[255] Barad, *Meeting the Universe*, 170.
[256] Bretislav Friedrich and Dudley Herschbach, "Stern and Gerlach: How a Bad Cigar Helped Reorient Atomic Physics," *Physics Today* 56.12 (2003): 53-59.
[257] Bohr tended toward the rhetoric of "soundness," "consistency," and "lack of contradiction." See Arthur Fine and Mara Beller, "Bohr's Response to EPR." *Niels Bohr and Contemporary Philosophy*. Netherlands: Springer, 1994): 1-31; Michael Dickson, "The EPR experiment: A prelude to Bohr's reply to EPR," *History of Philosophy of Science* (Springer Netherlands, 2002): 263-275.
[258] Niels Bohr, *The Philosophical Writings of Niels Bohr Volume 2* (Woodbridge, CT: Ox Bow, 1987): 33-40.

Inseparability is widely thought to be one of the most profound differences there is between quantum mechanics and the classical view of the universe.[259] And the inseparability is indeed a problem for language systems that cannot account for such dynamisms in "things." "In this situation," Bohr insisted, "we are faced with the necessity of a radical revision of the foundation of description and explanation of physical phenomena."[260]

Bohr insisted that predicates should not be understood as a problem of correspondence to reality. At the level of quantum probabilities and multi-dimensional pairs, there are no determinate "things" available to name. Nor are predicates problematic because of an epistemological problem; it is not that we cannot know something about quantum objects; rather, quantum characteristics such as discreteness, discontinuity, individuality, or indivisibility do not "belong" to or describe the essence of a "quantum object." The question for Bohr is fundamentally about the nature of reality. In essence, there is no such thing as a "quantum object"; there are only phenomena. What we call the study the quantum "objects," Bohr claims, requires a "terminological adjustment," whereby "phenomena" applies to physically complex entities, rather than to single physical entities. Bohr never addressed the problem of the collapse because to do so, he argued, would be to assume that waves and particles are physically real. For Bohr, however, the wave function should not be taken literally; it is a tool used for calculation. Quantum systems are not visualizable, he said, because their states can't be "tracked down." Any definite state prior to measurement simply doesn't exist. What does exist, however, is the interference of the measurement itself that serves to collapse the "thing." Philosopher of physics, Sheldon Goldstein, says that, "when all is said and done, the core of quantum philosophy is that physics is about measurement and observation, and not about objective reality. [Quantum physics] is about what seems and not about what is."[261]

This issue for Bohr is that we could never assume that this was "really" the case. To get around the realism problem, Bohr became convinced of the need for "complementary" descriptions, those which are "incompatible but equally necessary for a full description of the quantum system."[262] It is simultaneously true that quantum objects must be described and cannot be described in physical terms (as having either wave-like or particle-like properties, or any other properties, however conceived). Any "consistent quantum theory would have to abandon the classical goal of providing both a space-time description and a causal account of phenomena."[263]

Following Bohr, then, any set of symbols enlisted in a quantum experiment, whether they be concepts, equations, terms, or visualizations and so on, require us to adjust our perspective on their role; they are neither comprehensive of reality nor corresponding to reality; rather all symbols are situational to the particular experimental apparatus at hand.

## Qualities of a Quantum Diffractive Method

With this knowledge of measurement as crucial to quantum mechanics, we can now turn to exploring the characteristics of a quantum method of diffraction. First, the diffractive apparatus is not a visualizing device. The diffractive method is often characterized as

[259] Albert, *Quantum Mechanics and Experience*, 58.
[260] Niels Bohr, "On the Notions of Causality and Complementary," *Science, New Series*. Volume 111, No. 2873 (Jan. 20, 1950): 51-54.
[261] Detlef Dürr, Sheldon Goldstein, and Nino Zanghì, *Quantum Physics without Quantum Philosophy* (New York: Springer, 2013).
[262] Jan Faye and Henry J. Folse, *Niels Bohr and Contemporary Philosophy* (Dordrecht: Springer, 2011): xiv.
[263] Ibid., xv.

"illuminating," that is, diffraction lights up the dark corners of our mysterious world. However, Barad insists that the apparatus is not a mediating device: it is non-representational.[264] Characterizations of the diffractive method as a device for making visible the previously invisible truths tend to ignore the emergent nature of entities from phenomena. The apparatus is not separate from reality, it does not provide a view of or reflection upon reality. But Jacob Edmond (introduced in Chapter 1) uses diffraction in just this way. Using diffraction as a metaphor to guide our thinking, Edmond shines the light on the dynamism that has always lived in the translation between texts, but has not yet been seen. In treating entities as if they were *already there*, simply awaiting illumination, Edmond and others ignore the emergent nature of entities with their visualizing devices.

This approach to diffraction is a familiar form of critique, but one that relies on the assumptions of both individualism and humanism. If one enlists diffraction only as a metaphor, then as I argued previously, the relation between language and reality is maintained; neither inseparability nor indeterminacy are accounted for. There is a political danger in this method as well, I would suggest. To mistake the diffractive method as a means for visualizing what is already there, and a practice for "opening the eyes" of those who are still blind (either to the text or to the unconscious) too easily lends itself to what Isabelle Stengers and Phillippe Pignarre call "a pedagogical approach."[265] Capitalism, they argue, reduces the possibility of doing politics to a mere "opening the eyes" of victims. This approach, they say, is not unique to Marxism; within capitalism, rationalism testifies to the ability of some experts "to see through the illusions that imprison others." In their quest for a diffractive method that will "bring the material back in," I suggest, new material feminists must take care not to mistake the illuminating effects of diffraction for the pedagogical (and appropriating) move of illumination that "opens the eyes of the other" of the truths that have been there all along and have finally been uncovered.

Second, quantum diffractive methods would not privilege entanglement at the expense of decoherence. Barad's emphasis on the mutual entanglement and emergence of things is taken up by nearly everyone who employs the diffractive method. It is common for authors to focus primarily on entanglement, or the "mixed" and "co-constitutive" aspects of diffraction. However, as I have shown, entanglement is only half of the picture of diffraction, which is a triple movement of the entangled and decoherent emergence of phenomena, that is, from indeterminacy, brought about by arrangements of measure. As von Neumann stated this most clearly: "when no measurements are going on, the states of all physical systems invariably evolve in accordance with the dynamical equations of motion," and "when there are measurements going on, the states of the measured systems evolve in accordance with the postulate of collapse." The existence of "things" (as opposed to phenomena) requires a collapse, which stems from the measurement apparatus. The absolute relevance of measure to produce things, or "decoherence," has been largely ignored by approaches to the diffractive method.

Finally, quantum diffractive methods would recognize a dispersed account of agency. They would account for the fact that the scientist-subject creates the apparatus neither alone nor *ex nihilo*. Individual entities do not have causal agency on their own. Rather, agency is dispersed across networks of material practices. The apparatus involves a wider set of practices, both human and nonhuman, that exists in a dynamic interlocking relation with still other

[264] Barad, *Meeting the Universe*, 231.
[265] Phillippe Pignarre and Isabelle Stengers, *Capitalist Sorcery: Breaking the Spell* (London: Palgrave Macmillan, 2012): 20-25.

apparatuses.[266] Barad further argues that we need to attune ourselves to this type of dispersed agency. However, we need to take care that such attunement is not treated as a pedagogical practice of revealing the dark underbelly of power, or illuminating an ignorant and exploited group of their "oversight." Rather, intelligibility itself is produced through particular sets of material practices that trigger a triple move: entangled, decoherent emergence. Knowing, therefore, requires not a reflective "overview" of those practices, but rather, a diffractive account of those practices. Objectivity thus has been decentralized, placed into the apparatus and dispersed. Agencies of observation are productive not in the sense of "disturbing" other practices, but in the sense that they "interfere with" or emerge in and through those practices. Intelligibility is constituted through interlocking apparatuses.

We are now in a position to list what a quantum diffractive method is *not*: a reading strategy, a visual apparatus, a pedagogical insight. It is also not a disturbance or the privileging of entanglement at the expense of decoherence. Lastly, it is not directly causal, but adheres to a dispersed form of agency. The method is therefore a part of the apparatus as well; without a given apparatus, there is no way to differentiate between things. "The unambiguous account of proper quantum phenomena must, in principle, include a description of all relevant features of the experiment arrangement."[267] The arrangement of a given apparatus is complex and open-ended, as well as temporary and local. "Descriptively, there is a single situation."[268]

While the experiment is singular, the agencies of observation are plural. Lacking the distance that the principle of separability affords, individuals must account for themselves, not as individuals, but as agencies of observation entangled with the apparatus of measurement, producing and being produced by a measuring device that is diffuse. But this shift of focus toward the diffused apparatus cannot lead us into the kind of incoherence we saw in some of the diffractive methods I presented in Chapter 1. Barad insists that the diffractive apparatus must be both "precise and rigorous." I'm arguing that this situation of the plural apparatus and its dispersed agency do not necessarily lead to messy, ambiguous or incoherent sets of connections that completely lack boundaries. On the contrary, if we consider decoherence and the measurement problem, as well as the extended apparatus, this is precisely where we find the moment of the determination of things. Thus the need for a detailed investigation of the precise machinations of decoherence acquires relevance for new material feminism. What that investigation looks like exactly is still up for debate, however, and I will discuss it further in Chapters 3 and 4.

Barad, for her part, is extremely precise when it comes to accounting for the extensivity of an apparatus. She often offers non-exhaustive details and thick descriptions of situations, all of which, she argues, participate in what Barad calls an operation that is one-move, "cutting together-apart." While I am not convinced that detailed lists of objects, technologies, concepts, and histories are sufficient for the development of a quantum conception of diffraction, I am arguing that as specifically quantum, diffraction is a method that *accounts for the determination of a thing from indeterminacy*. The nature of Barad's quantum method, centering on indeterminacy as it does, certainly indicates her indebtedness to Continental philosophy, especially Gilles Deleuze's (taken from Gilbert Simondon's notion of individuation and the

[266] Of course, Barad's notion of dispersed agency is quite similar to claims made by Actor Network Theory (she is explicitly indebted to Latour), autopoietic systems theory, extended mind, and by process philosophers more generally, e.g., Gilbert Simondon, Henri Bergson, Alfred North Whitehead, and Gilles Deleuze.
[267] Barad quotes Bohr (1963 [1958 essay]: 4), *Meeting the Universe*, 119.
[268] Ibid., 118.

metastable state of the individual subject). Stated in the quantum register, diffraction as a method accounts for this indeterminacy in terms of quantum decoherence. Importantly, in its attentiveness to the exclusionary practices involved in any given system, quantum diffractive methods also refuse to privilege entanglement and its "positive" (and therefore "feminist") connotations. But simply providing long lists of entangled practices does not attend to the exclusions that matter, nor do they intervene on the binary relation between language and reality as it is currently conceived.

## Quantizing the Diffractive Method for New Material Feminism

My claim that quantum diffraction requires an account of exclusionary practices, or the cuts that produce determinate entities, presents a challenge to the new material feminist project to define new relations between language and reality. The linguistic turn toward constructivism in the critical humanities, and feminism in particular, has been the catalyst for taking up diffraction. As such, new material feminists have been keen to theorize new relations between language and reality. Their answer is to bring language "closer to" reality. They invoke metaphors that would create "intimacy," "nearness," and "proximity" between the material and linguistic realms. Hekman says the challenge is "to define a theoretical position that does not privilege either language or reality but instead explains and builds on [the] intimate interaction" between them.[269] Along these lines, following Haraway, some theorists affect this shift through diacritical marks like hyphenation (e.g., "material-discursive"). Like two pieces hinged together, the material and the discursive hang together typographically on the page.[270] In this spirit, Mazzei offers the additional symbolism of a bi-directional arrow positioned between the words (material ←→discursive), to designate both reciprocal movement between the two and equality of value.

While material feminists argue that the relations between language and reality need to be brought closer together, I want to suggest that this "closeness" relies heavily on metaphors of spatiality grounded in the separability principle. As such, they perpetuate the belief in an ontological split between language and reality. The entire new material feminist quest to "bring the material back in," relies on just this assumption of an absolute exteriority that Barad associates with Einstein's separability principle. If they seek to overcome the ontological gap between language and reality, then connecting terms or reversing terms will not affect this change. Instead, I argue that a more "real-istic" engagement with language is required.

In order to radicalize, or if you will, "quantize," the relation between language and reality, the differential relations between language and reality require more rigorous attention. Material feminism treats the split as a given rather than as an effect. In other words, it is not the bringing together of two separate entities that will overcome the ontological gap between

---

[269] Hekman, *The Material of Knowledge*, 3.

[270] It might be worth noting that the hyphenated terms are always written, "material-discursive" and never "discursive-material." I am not the first to draw attention to this as a logocentric pair, with a productive "other" term. Derrida says, "To do justice to the necessity [of overturn] is to recognize that in a classical philosophical opposition we are not dealing with the peaceful coexistence of a vis-à-vis, but rather with a violent hierarchy. One of the two terms governs the other…or has the upper hand." In a simple reversal of terms, the binary remains intact for new material feminism. See Jacques Derrida, *Positions*, Translated by Alan Bass (London: Continuum, 2004): 42-44. However, I also find the deferral involved in the spacing appealing; as a temporalization of *différance*, "deferring as genesis" seems to be a productive direction for theorizing the role of language in the quantum diffractive apparatus. Arkady Plotnitsky has laid the groundwork for this ideal. See *Complementarity: Anti-Epistemology after Bohr and Derrida* (Durham: Duke University Press, 1994).

language and reality. Rather, an investigation into the new materialist story reveals that "once upon a time" language and reality enjoyed an original unity, a unity that was mishandled by poststructuralism's emphasis on the power of language, resulting in the subsequent "loss" of materiality. This loss has produced a crisis in feminism. New materialist feminists will "save the day" by recuperating that original unity. I am not suggesting that feminists should provide a new story that finally "brings together" language and reality; rather, it would map the genealogy of their emergence in terms of a "becoming-separate," that is, investigate the productive effects of their differential relations. While new material feminists use the diffractive method as a reading practice to study the entangled "differences that make a difference," the differential relations between language and reality, as well as their effects, have been largely ignored.

In the next section, I will read Van der Tuin's essay co-written with Aud Sissel Hoel, "The Ontological Force of Technicity: Reading Cassirer and Simondon Diffractively," in order to suggest more tenable developments for a quantum version of diffraction. As a student of Rosi Braidotti, Iris Van der Tuin is deeply influenced by Gilles Deleuze and process philosophy and she has recently emerged as one of the leading voices in European feminist new materialism. Together with Braidotti, Van der Tuin is founding editor of the book series *New Materialisms* of Edinburgh University Press. She is author of *Generational Feminism: New Material Introduction to a Generative Approach*, and co-author with Rick Dolphijn of *New Materialism: Interviews & Cartographies*, which is quickly emerging as a classic text in the field of new materialist studies. She is also a pivotal figure in the European attempt to "reclaim" the humanities from the neoliberal university (see introduction), as chair of the COST Action "New Materialism: Networking European Scholarship on 'How Matter comes to Matter.'"[271]

## A Return to Diffractive Approaches

Employing Barad's diffractive method as an "experimental practice of reading," Van der Tuin and Hoel are indeed attentive to what they call "differential encounters." They aim to "open up" Cassirer and Simondon's theories to a reader who, they hope, will in turn, further "contribute to open-ended systems of thought." By means of these open-ended communications, they seek to "set the stage for differential encounters."[272] The experimental nature of Van der Tuin's and Hoel's approach and the reference to the differential seems promising; it seems to correspond to a quantum method of diffraction. And yet, as I mentioned before, it is ultimately the similarities that Van der Tuin and Hoel highlight, and the overall effect is a kind of smoothing over of difference. The authors quote Barad, citing diffraction as "a strategy that involves reading insights through one another to illuminate how differences get made, excluded, and how exclusions matter." Their method of "reading with" is peppered with references to interference patterns in the scientific diffraction experiments. However, as in so many other diffractive accounts of texts, in theirs too, interference is still tied to a disturbance phenomenon, as well as to the representations in the experimental apparatus (patterns of light appearing on a fluorescent screen).

Interference patterns always indicate wave behavior. And yet, wave patterns cannot be seen by the naked eye and must be detected by a larger experimental apparatus. In the case of the double-slit experiment, the apparatus involves dots of light on a fluorescent screen, each representing one electron "hit." The pattern of banded light reflected on the back screen of the

[271] COST New Materialism, "Memorandum of Understanding," http://www.cost.eu/COST_Actions/isch/IS1307?
[272] Van der Tuin and Hoel, "The Ontological Force of Technicity."

double-slit experiment has become an iconic image of diffraction. This representative image taken from the double-slit experiment has metonymically slipped into the position of conceptual ground for theorizing all instances of diffraction, and the basis for the diffractive method. However, the double-slit experiment was not originally set up to "read" diffractive patterns; the patterns accidently showed up, indicating to scientists that particles were "acting like" waves. The fact of the matter is that physicists cannot explain the spooky movement of electrons. As philosophy of physics, David Arnold, reminds us: "this fluorescent screen is a measuring device for the position of electrons" and not a clear proof of anything else.[273]

As part of the apparatus, the fluorescent screen is one element of the apparatus that produces an exclusionary cut and brings the electron to our attention as having "collapsed" from a probability function into a local position. In addition, diffractive apparatuses are only singularly, not generally, descriptive. As Barad notes, "if you change the apparatus, you change the "thing."[274] It is the case that interference patterns always indicate wave behavior, and thus a state of superposition. The problem for any given diffraction reading is not that a representation is being used or even borrowed, since it is neither a problem of correspondence nor of epistemology, as Bohr showed. Rather, it is a question of the nature of reality itself: representations, concepts, equations, and terms are not simply "there" for the taking, but are part of the larger productive apparatus. An accounting of these representations—the ways in which we are able to come to see at all—is the role of the diffractive apparatus that "sees," or the diffractive apparatus which operates as a visualizing device. Rather than simply assuming that we what we are witnessing "is" wave patterns and difference, Van der Tuin and Hoel might provide an account for the ways in which these so-called "illuminating waves" show up at all. What counts is not merely what is known about a thing, but rather how we know what we know, that is, an accounting of the conditions of possibility for intelligibility. Another way of thinking about this method would be for new material feminists to consider the conditions of possibility of their own "untangling" practices. What are the sets of real material practices involved in the determination of intelligibility?

Let's look more closely at the "differential encounters" that Van der Tuin and Hoel claim to create. Van der Tuin and Hoel attempt to complicate the boundaries of their objects by arguing that they are entangled, for example, they argue that for both Simondon and Cassirer, "the human is seen as deeply entangled with nature, engaged in an on-going process of co-formation."[275] As I pointed out in Chapter 1, Cassirer's and Simondon's ideas about technology are consistently characterized as similar. Objects are still treated as primary and separation still prevails; in this case, the human and nature are entangled, but emergent. Nevertheless, the logic of their diffractive method maintains the priority of entanglement over exclusionary productions.

Differential transformation is achieved through the bringing together of two sets of ideas. "Both thinkers [Simondon and Cassirer], who are here brought together for the first time…give ontological priority to technicity." The "objects" with which Van der Tuin and Hoel experiment may be deemed nontraditional since they are not objects per se, but "philosophical ideas" or "insights" that are diffractively "read through one another." They do this to "revitalize the notions of 'nature' and 'the human,' which are now understood as coevolving with technology."[276] In the entangled system of Cassirer and Simondon, philosophical concepts,

[273] Arnold, *Quantum Mechanics and Experience*, 12.
[274] Barad, *Meeting the Universe*, 106.
[275] Van der Tuin and Hoel, "The Ontological Force of Technicity," 188.
[276] Ibid., 187.

insights, authors, essays, and even the politics of "the present day," all hang together in a co-constitutive, co-evolving, and co-formulating system. Their "positive" critique privileges entanglement at the expense of decoherence. Quantum diffractive methods would have to account for both entanglement and decoherence.

Despite these entanglements, there is no acknowledgement of their own entanglements. And although they do quote Barad regarding the relevance of exclusionary practices for diffractive methods, there is no explicit discussion of its effects as differential.

Change does not occur for Van der Tuin and Hoel at the level of the apparatus, but rather merely in terms of size (for example, from pellet to electron). Since their objects are not typical "entities," their ontological presence is never defended, but rather assumed to be "objects." Furthermore, these "objects" are treated, both semantically and ontologically, like other Newtonian objects that move around and affect each other. Because diffraction in science usually deals with invisible entities (light waves, sound waves, electrons, etc.), in other words, "objects" that cannot be seen by the naked eye, diffractive reading methods like Van der Tuin and Hoel's tend to treat their "objects" in the same "infinitely small" manner, that is, they treat their "micro" objects in terms of Newtonian conceptions of space and time. They treat them like "smaller" versions of everyday objects. However, their existence as "objects" was never ensured in the first place.

Demonstrations of the manner in which these small objects "intra-act" or co-construct one another tend to rely on the objects simply being microscopic or invisible things. Rather than operating in any "quantum" manner, that is, having interactions with their measuring apparatus, the micro-objects are made visible by the reading that invents them. I turn to Deleuze and Deleuze and Guattari more extensively in the next chapter, but suffice it to say for now that "the principle of differential philosophy must…in no way depend on the infinitely small."[277] The result of this shrinking down of objects to the level of "infinitely small," relies on the atomism of classical diffraction. Rather than quantized probability functions, these small objects reflect a kind of corpuscularism.[278]

Furthermore, the infinitely small things tend to refer to objects that were already there, but are "just now" being noticed. The aim of their paper, claim Van der Tuin and Hoel, is to "push Cassirer and Simondon further in the direction that their essays are already moving" and to "demonstrate their current relevance."[279] While diffractive methods like theirs do tend to treat their objects as entangled and emergent, they do not treat objects with respect to their prior indeterminacy, probability, or inseparability.[280] Scaling down to the quantum level, "things" act differently; most importantly, they only show up to the naked eye by means of a particular experimental apparatus. That apparatus must be accounted for, since it is precisely what makes the "objects" show up as determinate objects at all. On the quantum scale, the shift from indeterminacy to determinacy happens at the level of measurement. Measurement at the quantum level is crucially constitutive. Without an account of the constitutive apparatus, there can be no discussion of how, exactly, two "things" overlap or are entangled. Van der Tuin and Hoel shrink their entangled entities down to size. However, given that phenomena, and not objects, are

[277] Gilles Deleuze, *Difference and Repetition*, Translated by Paul Patton (London: Bloomsbury Press, 2014): 170.
[278] Corpuscularism is a form of atomism popular in the 17th century and advocated by Hobbes, Locke, Descartes, and others. The main difference between atomism and corpuscularism is the existence of the void; corpuscles moved through other matter. See Thomas S. Kuhn, *The Essential Tension: Selected Studies in Scientific Tradition and Change* (Chicago: University of Chicago Press, 1977): 53-4.
[279] Van der Tuin and Hoel, "The Ontological Force of Technicity," 190.
[280] To argue that these are "prior" is problematic, and Barad addresses this issue, *Meeting the Universe*, 74.

fundamental, simply shrinking things down to the micro size is a technique that conforms to atomistic physics: small things bumping around in a void. Rather than merely change the scale of objects from macro to micro, which is equated with visibility and invisibility, a quantum analysis would provide a genealogical map of precisely where and how the boundary-making cuts of the invisible objects are made visible. Most diffractive accounts merely assume that their method can "make" anything visible (anything goes).

Attunement is key for Barad. Determinacy is not fundamental, she argues, indeterminacy is; and further, "the necessary condition for resolving indeterminacy is the existence of a specific measurement apparatus."[281] Quantum superposition is the strange situation that implies the electron is both here and there, as well as not here and not there, and also neither of those two. It is all of them (and none of them) at the same time … *until an observation is made*.[282] The observation is what makes the cut to produce the "objects." This is the agency that produces the emergence of individuals from phenomena. This is where exclusion or decoherence becomes so incredibly important to quantum diffraction. It is not merely the fact of entanglement, but the very process of exclusion whereby a previously entangled object appears as separate, that matters for diffractive analysis. *Without an attunement to the agencies of observation, no quantum diffraction is occurring.*

## Conclusion

Answering for the discrepancy between wave probability and particle location has been hailed as the most controversial mystery in quantum mechanics. There are many other less mysterious difficulties that would need to be dealt with in the shift from the classical physical system to the quantum. Stability, predictability, and correspondence characterize classical diffraction. Classical diffraction is relatively easy to deal with since it conforms to the way in which humans experience the world. And in their correspondence to our world, physical objects can be referred to symbolically, formally, and linguistically. Classical physics deals with a predetermined set of values (e.g., space and time coordinates), and is also completely deterministic; given exact positions and velocities of a particle at a given time, one can predict its future positions and velocities at any other time.

Quantum mechanics, on the other hand, has no such set of stable references. Quantum objects cannot be measured or experienced by the naked eye. All experiments that lead us to discover new findings about the quantum world rely upon techniques that reveal the quantum realm to our human faculties. Quantum mechanics is also probabilistic, rather than deterministic. As such it forces us to dispense with precisely defined notions like particles, as well as precise time and space coordinates; instead we can only speak probabilistically, and furthermore, our language is insufficient for describing so-called "quantum objects." Wave functions in quantum mechanics are "complex-valued functions;" at the same time, probabilities are "always real," but may or may not correspond to something physical.[283] The wave equation for matter is unwieldy because for any given physical system, *all* relevant forces exerted on the particles must be incorporated, rather than only predetermined ones.

---

[281] Barad, *Meeting the Universe*, 127. For a discussion of the distinction between indeterminacy and uncertainty, also see 295-302, as well as Landé, *New Foundations of Quantum Mechanics* and Bitbol, *Schrödinger's Philosophy of Quantum Mechanics*.
[282] Arnold, Quantum Mechanics and Experience, 21. Emphasis mine.
[283] Albert, *Quantum Mechanics and Experience*, 39.

Even so, it is impossible to account for all of these forces collectively or simultaneously; while a solution in quantum mechanics yields a discrete value of energy, in general, these wave functions are "complex conjugates" with only a "probability density" rather than certainty.[284] Complementarity prevents us from measuring all aspects at once (only partial measurements can ever be taken), but simultaneously requires us to include concepts and terms (with terminological adjustments, as Bohr says) in the apparatus that measures, whether they correspond to "reality" or not. Furthermore, since each measurement entails a new organization of the apparatus, no two measurements yield identical results. In other words, the diffraction experiment is purely experimental, that is singular, new each time.

"The essential issue," according to Barad, is the way in which the ontological ambiguity is *resolved* only for a particular experimental arrangement. "If the experimental arrangement is changed, there is a corresponding change in the cut, that is, in the *delineation* of "object" from "agencies of observation" and the causal structure…enacted by the cut.[285] One aspect of developing a particularly quantum diffractive method for new material feminism might be to experiment with the constitutive nature of measurement, to explore measurement as a concept (as von Neumann suggested), rather than take it as a given. Taking account of "all relevant forces" in exerted on the object, as I have shown, involves a practice of "render(ing) visible the invisible practices involved in the act of representing." In accounting for the forces that produce a cut, quantum diffractive methods should also be able to account for, or return to, the sets of practices necessary for any given rendering.

In other words, quantum diffraction, as I showed in Chapter 1, is not merely a reading strategy, nor is it, as I have shown here in Chapter 2, a practice of creating a lens through which to render visible the invisible powers; diffraction is not pedagogical.[286] Rather, I am insisting that quantum diffraction is at least in part a genealogical practice of rendering visible the invisible practices of representation in order to account for what lets us see something at all. Diffraction is a precise account of the material practices that produce intelligibility. This notion of diffraction as genealogical goes back to Haraway's claim that "the point is to make a difference in the world," and to do that "one must be in the action, be finite and dirty, not transcendent and clean. Knowledge-making technologies…must be made relentlessly visible and open to critical intervention."[287] Representation, and its role in the production of intelligibility, is not something to be gotten around, but something to be accounted for.

As Niels Bohr noted, language and writing are crucial aspects of our accounts of science. Quantum objects, he claimed, must be described and cannot be described. Despite the new material feminist insistence that "language has been given too much power," it is now clear that as representational practices, language and writing participate in the measuring apparatus, and as such, cannot be taken for granted; on the contrary, they are "knowledge-making technologies" that "must be made open to critical inquiry." Language and writing thus need to be investigated

---

[284] Peter J. Steinbach, "Classical and Quantum Mechanics—in a Nutshell," Center for Molecular Modeling, 15 Nov. 2010 (2010). "Conjugate" in this sense requires an understanding of Bohr's concept of complementarity, which states that only one aspect of an entity may be measured at a time (e.g., position or momentum, energy or time). "Conjugates" are formal pairs comprised of a real number and a variable. Thus, conjugate pairs produce uncertain values. Barad explains this beautifully in her reading of Michael Frayn's play *Copenhagen* (1998), *Meeting the Universe*, 4-37.

[285] Barad, *Meeting the Universe*, 274 (emphasis mine).

[286] In Pignarre and Stengers' sense of the term. That said, outside of new material feminism, the popularity of diffraction is perhaps growing fastest in the field of education.

[287] Haraway, *Modest Witness*, 36.

more, not less, rigorously. Barad reminds us that the productive relations between language and reality should not be new to us: Nietzsche claimed a hundred years ago that the creativity involved in the production of intelligibility needs to be accounted for. Unlike some of the new material feminist deployments of the diffractive apparatus, this process of accounting for intelligibility cannot be reduced to vague or fuzzy notions, but rather, involves a precise and relentless evaluation of its own productive capacities. Theorizing new relations for language and reality is a necessary but daunting task. And this is only one of the many difficulties that face new material feminists who would pursue a particularly quantum method of diffraction. In the next chapter, I continue to pursue the question of a quantum method of diffraction. To do so, I turn to Gilles Deleuze and Felix Guattari, whose work offers a supplement to our thinking about a precise role for writing, especially as it relates to the measurement problem in quantum physics.

# Chapter Three
# Outlines of a Quantum Diffractive Method

*Writing has nothing to do with signifying. It has to do with surveying, mapping, even realms that are yet to come.*
—Gilles Deleuze and Félix Guattari

*It is never the beginning or the end which are interesting; the beginning and end are points. What is interesting is the middle. Bottlenecks are always in the middle.*
—Gilles Deleuze

*A book of philosophy should be in part a very particular species of detective novel, in part a kind of science fiction. By detective novel we mean that concepts … should intervene to resolve local situations… Science fiction in yet another sense, one in which the weaknesses become manifest. How else can one write but of those things which one doesn't know, or knows badly? It is precisely there that we imagine having something to say. We write only at the frontiers of knowledge from our ignorance… Only in this manner are we resolve to write. To satisfy ignorance is to put off writing until tomorrow—or rather to make it impossible.*
—Gilles Deleuze

## Introduction

In the recent special issue of *Parallax* devoted to diffraction, editors Kathrin Thiele and Birgit Kaiser laud the method as "an alternative vocabulary and different technology for critical inquiries," "a praxis of analysis that foregrounds differentiality," and an alternative to "reflection" as "a metaphor for our epistemologies." Diffraction "affirms our knowledge-practices as mattering," and highlights the "fundamental material relationality of a diffracted/-ing world."[288] The popularity of diffraction as a method has extended from its origins in feminist theory to an ever-wider range of disciplines, which now includes film and media studies, anthropology, urban studies, philosophy, food and animal studies, data analysis, comparative literature, and education. But as I showed in the previous chapter, although the method was refined by quantum theorist Karen Barad, the method of diffraction as it employed across the disciplines does not resemble anything particularly quantum. Instead, as I have shown, it follows a classical model of physics and relies on the conceptual assumptions of the separability and the pre-existence of objects. As a result, even as the diffractive method hinges on theories of emergent entanglement, these remain tethered to a presupposed atomism (or perhaps corpuscularism) and its classical metaphors of overlapping and amplification. I also demonstrated that although new material feminism attempts to deconstruct the language/reality dichotomy, this same atomism constrains the new material feminist project. If new material feminists wish to move past language/reality dichotomy by employing diffraction as a method, then, despite the many difficulties, I argued that an investigation of how a specifically a quantum understanding of diffraction might help to overcome these difficulties is in order.

Developing such a method of quantum diffraction is daunting. Samantha Coole, Susan Hekman, and others have already noted the hegemonic and pervasive influence of linguistic

[288] See Kaiser and Thiele, "Diffraction: Onto-Epistemology, Quantum Physics and the Critical Humanities," *Parallax* 2014: 165-167.

constructivism that prevents the emergence of more "stubbornly real" materials for the critical humanities. But this is not the only obstacle. I have been arguing that the tendency to view diffraction mainly as an interpretive strategy that "connects" and "entangles" things is particularly troubling—not only because it largely ignores the productive role of exclusionary practices, but also because it tends to shy away from the way in which time, dynamism, and iteration play a key role in that productivity. Barad relies heavily on Judith Butler's concept of performativity, which says the materialization of bodies depends upon what she calls "iterative citationality." Barad quotes Butler's important point that "a return to the notion of matter" away from the flawed concepts of social construction proposes matter "not as a site or surface (as in the inscription model) but as '*a process of materialization that stabilizes over time to produce the effect of boundary, fixity, and surface we call matter'* (1993, 9)."[289]

As I showed in chapter two, a quantum understanding of diffraction would also attend to the concept of decoherence, or the drop of a wave probability into a localized particle. Decoherence is *the* crucial aspect of quantum superposition, and yet it has been largely ignored by those who seek to translate the concept of "quantum" diffraction into their home discipline. Diffraction involves not only entanglement, but also the very process of exclusion whereby entangled objects come to appear as separate at all.[290] In addition, central to decoherence is the role of the measurement apparatus, in other words, the situational *hic et nunc* of experimental practice. Utilizing decoherence as a concept for engaging the diffractive method enacts attunement to the agencies of observation, the exclusionary and constitutive role of the measurement apparatus, and the "moment" of its performativity, which is not only about its boundaries understood spatially (inside/outside), but also about its continual temporal re-negotiation. Decoherence is also important, then, because it reminds us that, as Haraway insists, "the semi-permeable self" who engages with others, both human and non-human, always has "finite consequences; of situated possibilities and impossibilities of individuation and identification; and of partial fusions and dangers."[291] In this chapter I begin to attend to decoherence as an exclusionary and temporally dynamic practice, one that attempts to move beyond interpretive strategies to visualize ever more entangled relations. In other words, I propose to investigate the cuts and their "finite consequences," by offering a genealogy that would account for a given interpretation, and the ways in which that interpretation operates as a cutting apparatus and thereby contributes to the emergence of things.

I draw attention to the need for a careful scrutiny of "language" and the accusation that it has been "given too much power." I will argue that it is precisely through language, but more precisely, a re-evaluation of the literary text composed of language, that the material might be "brought back in" to feminism. As I have argued throughout, feminists cannot simply accuse language of being "given too much power," and then "reject" or ignore it; nor can we only treat language "inclusively," that is, as one of many components in an overall interpretive strategy that aims to both unify and maximize the connections and entanglements of things. Rather, in what follows I want to entertain the proposition that a new image of thought of the book effects a transformation of the literary text into "experiment-al" writing. The connotations surrounding

---

[289] Barad, *Meeting the Universe*, 64 (emphasis in the original). Barad's only quarrel with Butler's concept of performativity its "humanism" that brings passivity of matter in through the back door.

[290] Barad doesn't use the physics term, "decoherence," but it is implied in her critical expansion of Butler's concept of performativity. See also *Meeting the Universe*, 192.

[291] Haraway, "Biopolitics and the Postmodern Body: Constitutions of Self in Immune System Discourse," in *Simians, Cyborgs, and Women*.

"the experimental" book is useful for a few reasons: first, it references the space of the science laboratory and the situational and repeated practices of scientific experimentation; the relation between this singular event of the experiment should evoke what Haraway calls, "the situated possibilities of individuation," in other words, what I have been referring to as "the drop into determined state" that occurs by means of the experimental apparatus; second, "experimental" connotes a form of nontraditional or even subversive writing that experiments on itself and questions its own limitations; third, the connotations of the French word *expérience* that means both "experiment" and "experience," does not limit the literary experiment above to the space of the text, but rather allows that experiment to incorporate wider experience. In other words, I will attempt here to detach the notion of the "experimental" from the literary and re-attach it to Deleuzian empiricism. In what follows here, I aim to present an image of the book and writing that are capable of exceeding their normal limits as "merely" representational, and theorize them as real and integral parts of the diffractive measuring apparatus. This notion of the book, then, contributes not only to entanglement, but also to the production of constitutive cuts and exclusions. When writing is included in the measurement apparatus, I suggest, it is necessarily bound up with the process of determination; this role of writing to determine can be compared to the process of decoherence in quantum experiments, whereby the measurement of a wave probability produces a localized particle. Additionally, unlike representational practices that operate to "erase" their own generative gestures, these experimental practices of the book are uniquely capable of remaining accountable for those exclusions that matter. Ironically, it is through language and something I will call "decoherent writing," I want to suggest, that feminism can finally "bring the material back in."

There is a precedent in thinking about the productive nature of exclusions in writing together with quantum mechanics. In *Complementarity: Anti-Epistemology After Bohr and Derrida*, Arkady Plotnitsky draws an analogy between Niels Bohr's notion of indeterminacy and Jacques Derrida's theory of undecidability. Both, he argues, entail affinities and differences, but what they share is an account of a general economy that both represent major anti-epistemological developments. Derrida introduced a deconstruction of the classical concept of writing as a representation of speech. In *Of Grammatology*, Derrida offers a general economic science of writing that is opposed to the restricted economy of (Saussurian) linguistics, the science of speech. As Plotnitsky rightly points out, Derrida's deconstruction does not dispense with or simply reverse these oppositional pairs:

> It is not enough simply to reverse the opposition and hierarchy which privileges speech over writing by virtue of its closer proximity to thought, logos, or truth. One must produce a new concept, possibly by using a reversal as a phase and, strategically, borrowing a name, such as writing, from the subordinate member of a given hierarchy. By means of such a new concept, or a network of concepts, the whole preceding configuration… is recomprehended.[292]

Plotnitsky describes the ways in which Derrida's science of *writing*—which includes the joint dynamics of *différance*, trace, supplement, dissemination, and *writing*—is the same economy at work in quantum mechanics.

It is not Derrida, however, or even Barad who helps to appreciate what the "decoherence of writing," or the functional role of writing could become in the experimental apparatus. The

[292] Plotnitsky, *Complementarity*, 61.

real thrust of this chapter engages Gilles Deleuze's and Felix Guattari's work on the rhizome, and in particular, the image of the thought of the book in *A Thousand Plateaus*. In exploring the material potentials of the book, I find there is a tension between the traditional concept of the "text" and another contested, but nascent, concept of "the book." In the first section of this chapter, I revisit the rapid spread of rhizomatics as a general critique of Western rationalism in order to show how this scaling up of rhizomatics effectively "cut out" the importance of the book. I thus offer a reclaiming of the book for rhizomatics. In Chapter 4, I will use the reclaiming of the book for rhizomatics as a model for reclaiming it for diffraction as well. Once reclaimed, we can re-turn writing to the "weird" logics of quantum diffraction, where it is allowed to play a role in decoherence.

## The Question of the Quantum Scale

According to the story told by new material feminists, diffraction was introduced by postcolonial feminist Trinh Minh-ha as an optical metaphor. She developed diffraction as a means for imagining new relations among subjects that refuse to displace the negative other trapped in a binary pair.[293] In her commentary on Trinh, Donna Haraway extends diffractive relations to nonhumans as well, arguing for diffraction as a trope for knowing, one that allows us to see the "vision-as-knowing" trope for what it is, and to "visualize" the more subtle differential patterns available to us. Folding Trinh and Haraway's metaphorical versions back into the physical phenomenon of diffraction, Karen Barad's new "method of diffraction" proved incredibly flexible. As a "real" physical phenomenon, diffraction appeals to the new materialism, because it plays a fundamental role in nearly all optical phenomena; diffraction seems to be "happening everywhere, naturally."[294] "First and foremost," Barad claims, diffraction is "a critical practice for making a difference in the world" and she means that literally.[295] As a natural phenomenon, diffraction operates as a purportedly "material" mode of critique.

Now a full-fledged method, diffraction has been applied across a wide range of disciplines, gaining popularity as a specifically "material," but also general, mode of critique, or a "critique of critique."[296] Barad's agential realism and its critical method of diffraction are positioned by Susan Hekman to "save" feminism from its current crisis.[297] Barad's approach is a "template for the new paradigm emerging in contemporary thought," Hekman argues, and applies "not just to feminism but to all aspects of critical thought."[298] With the diffractive method at its side, "feminism is at the forefront" of a "sea change in intellectual thought." [299] New materialism has been called "a label for analytical approaches that seek to reclaim the indispensible and transforming involvement of materialities in everything from political

---

[293] Trinh T. Minh-ha, "Not You/like You: Postcolonial Women and the Interlocking Questions of Identity and Difference." *Inscriptions* 3 (1988): 71-77; Haraway, "The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others." Lawrence Grossberg, Cary Nelson, Paula A.Treichler, *Cultural Studies* (New York: Routledge, 1992): 295-337.
[294] Barad, *Meeting the Universe*, 80.
[295] Ibid., 90.
[296] See Van der Tuin, "Deflationary Logic: Response to Sara Ahmed," *European Journal of Women's Studies* Vol. 15(4) 2008): 411–416.
[297] Alaimo and Hekman, *Materialism Feminisms*, 106.
[298] Ibid.
[299] Hekman, *The Material of Knowledge*, 2.

economy to every life and the construction of gender, race, and sexuality."[300] Once diffraction has "scaled up" sufficiently, it will be positioned to effect a revolutionary sea change for the whole of critical humanities and social sciences, initiated by feminism.[301]

At the same time that the diffractive method is being scaled up, it is simultaneously part of the trend toward "scaling down." For some decades now, critical theory has championed many different versions of the "small": on the heels of Freud's theory of psychic energy comes Foucault's theory of disciplinary power on the body; Deleuze's so-called "molecular revolution"; Bruno Latour's imperceptible actors and networks; Elizabeth Wilson's neurological systems and metabolism; Elizabeth Grosz's reworking of Irigaray's sexual difference in terms of genetic variation; Paul Rabinow and Nikolas Rose's micro-bio-politics; affect theory read through both Brian Massumi and Silvan Tompkins.[302]

Perhaps the most recent small entities in need of analysis are microaggressions. Microaggressions are particularly interesting because of their strange double existence as both linguistic and material entities. Defined by Columbia professor of counseling psychology Derald Wing Sue in *Microaggression in Everyday Life: Race, Gender and Sexual Orientation* (2010), microaggressions are 'unconscious,' 'unintentional,' 'invisible,' and 'spontaneous' things for the perpetrator, and often for the target; "operating below conscious awareness," microaggressions "oppress in unseen ways."[303] In Iris van der Tuin's "Microaggressions as New Political Materials for Feminist Scholars and Activists: Perspectives from Continental Philosophy, New Materialisms, and Popular Culture," she insists that we cannot know what "analytico-political" work that microaggressions might be able to perform until we are clear on what they *are*. "After all," writes Van der Tuin,

> the ontological status of microaggressions and their mode of operations are fascinating: what are these allegedly infinitesimal hostilities? How do they reach their target and, once they have arrived there, how do they take effect? What assumptions about the constituents of the world do scholars and activists make when, through language they imply that microaggressions are indeed "out there" and therefore researchable?[304]

Citing Foucault, Van der Tuin reminds us that of his argument that, "[o]f course, discourses are composed of signs; but what they do is *more* than use these signs to designate things. It is this

---

[300] Milla Tiainen, Katve-Kaisa Kontturi and Ilona Hongisto, "Preface: Movement, Aesthetics, Ontology," *Cultural Studies Review* Vol. 21 No 2. September 2012.
[301] Alaimo and Hekman, *Materialism Feminisms*.
[302] See Deleuze, *Spinoza: Practical Philosophy,* Translated by Robert Hurley (San Francisco: City Lights, 2007); Deleuze and Guattari, *A Thousand Plateaus;* Elizabeth Grosz, *Becoming Undone: Darwinian Reflections on Life, Politics, and Art* (Durham: Duke University Press, 2011); Michel Foucault, *Discipline and Punish: The Birth of the Prison,* Translated by Alan Sheridan (London: Penguin, 1977); Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory*, (Oxford: Oxford University Press, 2005); Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network Theory*, (Oxford: Oxford University Press, 2005); Paul Rabinow and Nikolas Rose, "Biopower Today," *Biosocieties* (2006); Silvan Tompkins, *Affect, Imagery, Consciousness Volume 1* (New York: Springer, 1991); Wilson, *Psychosomatic*. For more on microaggressions, see Iris Van der Tuin, "'Something heredominates the diversity of systems': Microaggressions as New Political Materials, Feminism, and Bergson" *Australian Feminist Studies* (2016).
[303] Derald Wing Sue, *Microaggression in Everyday Life: Race, Gender and Sexual Orientation* (Hoboken: Wiley & Sons, 2010): 8.
[304] Van der Tuin, *Australian Feminist Studies* (2016): 246-262.

more that renders them irreducible to language (*langue*) and to speech."[305] Van der Tuin wonders about how these "new political materials" might fit into the new materialist discourse. Her questioning around the ontology of microaggressions, I want to suggest, emerges not only in the midst of this scaling down trend, and but also implies a distinct relation with Bruno Latour's questioning of the urge in the critical humanities to find "an explanation…for what is really going on underneath." He compares this tendency to conspiracy theorists, who "appeal to powerful agents hidden in the dark acting always consistently, continuously, relentlessly" in hopes of finding "causal explanations coming out of the deep dark below."[306]

Latour's essay reads like a palinode, warning against the dangers of the "debunking" practices employed by the social critic of science; he submits a plea for associating the word "criticism" with "a whole set of new positive metaphors," and "habits of thought." Critique, Latour says, should be "associated with *more* not less, with *multiplication*, not subtraction…that is, with generating more ideas than we have received."[307] I do not think it is a coincidence, then, that alongside the urge to find a causal structure in the dark spaces "underneath," what feminist critics end up finding "down there" are invisible things, but also very small things. Microaggressions are merely the latest in a long line of small entities to be discovered by critics. The discovery of these new small things of course require and are also built upon the emergence of new technologies for "seeing," "recognizing," "identifying," and dealing with them.

The first problem with respect to diffraction and its subatomic entities is that a distinction has yet to be made between the level of classically entities assumed by atomistic approaches and the nature of quantum "objects," which properly speaking, do not exist. I have also made it clear that a quantum diffractive method would have to account for its own measurements, for the fact[308] that they bring entities into being and that their measurements are never generalizable—they are always local (see Chapter 2). Moreover, the real difference between quantum diffraction and other small entities is that the quantum realm does not operate according to classical physics, with objects moving around in a void. Quantum "entities" are not objects all, and thus are not merely small, but "weird."[309] The "spooky" extensions of a quantum entity across great distances does not map onto a classical scale of "big and small." It is simply not the case that quantum entities operate in the same manner as everyday objects, just on a smaller scale, and yet this is precisely how they are treated in the diffractive discourse.[310] Referred to pejoratively by Einstein as "spooky," and by others more fondly as "weird," the quantum realm simply does not

[305] Michel Foucault, *The Archeology of Knowledge and the Discourse on Language*, Translated by A.M. Sheridan Smith (New York: Pantheon Books) [1969] 1972): 49.
[306] Latour, *Has Critique Run Out of Steam?, 229.*
[307] Latour, *Has Critique Run Out of Steam?,* 248
[308] In using "the fact" here, I do not refer to an "objective fact." As I explained in Chapter 2, the measurement problem precludes any definitive statement of fact regarding what is happening in the particle "collapse." I use the term "fact" here not to designate any binary relations between fact/fiction or objective/subjective knowledge, but more in Latour's sense of a "matter of concern" that is "stubbornly realist," and directs our attention to "the conditions that made them possible." See Latour, *Has Critique Run Out of Steam?*
[309] For more on quantum weirdness, see Andrey Grib and Waldyr Alves Rodrigues Jr., "Nonlocality in quantum physics," *Springer Science & Business Media* (1999); Jean-Michel Raimond and Serge Haroche. *Exploring the Quantum*, (Oxford University Press, Oxford, 2006); Brian Cox and Jeff Forshaw, *The Quantum Universe:(and why Anything that Can Happen, Does)* (Da Capo Press, 2013).
[310] See Stacey Moran Nocek, "Dangerously Small Things: Response to Iris van der Tuin," *Australian Feminist Studies* 31:89 (2016): 267-275.

operate by means of the same logics.[311] We would do well to remember that it is not only the "objects"—which, as Bohr says, don't really exist—that are different, but also their very different logics that matters for quantum diffraction.

The history of the term "weirdness" refers to the duel between Bohr and Einstein, part of which happened at the Solvay conference. Einstein insists that Bohr's version of quantum mechanics is not complete because he cannot account for certain things (e.g., photoluminescence) at the same time. Bohr argues that this reflects not the incompleteness of his theory, but the incompleteness of the universe. Using classical terms, concepts and measures, and other idealizations (symbols, analogies, etc.) is absolutely necessary for a description of what is going on, but the description is never "complete." Quantum measurements preclude measuring two things at once—like time/energy or position/momentum. These formal conjugate pairs produce "probability density" rather than certainty. One must engage them both without resolving their incompatibility.

Physicists often talk about the weirdness of matter when it "acts like a wave." This is usually referred to as "wave-particle duality." Bohr prefers the term "complementarity" instead. Bohr's complementarity says that sometimes representations of light require us to talk about light in terms of waves, and at other times, it requires us to talk about them as particles, or photons. But the two instances are mutually exclusive. In each case, the terminology we use depends directly on the experimental apparatus that is measuring, observing, and gathering knowledge. Light "is" both wave and particle, but we can only gather information about light, that is, we can only see light represented as either a wave or as a particle, never both at once. They never show up at the same time. This is the weirdness of the quantum: it's not one or the other (wave or particle), but both, and yet although it is both, it is never both at once.

Here's another way to put things: in "scaling up," we run the risk of turning diffraction into something that can be generalized, that is, taken as a general method of interpretation that can be applied to an ever-wider array of objects, situations, and practices. We run the risk, also, of relying on diffraction as an "affirmative" critique; in its additive form, affirmation views everything as entangled and emergent. This necessarily presumes some vantage point from which one could see that "everything is entangled and emergent."[312] However, But as I pointed out in Chapter 2, it also avoids the violence of decoherence. Of course, scaling up is only possible because diffraction is also and simultaneously a "scaling down," that is, it utilizes small and ubiquitous "things." But in scaling down, the weirdness of the quantum gets overlooked. This is all to say that inherent to the rapid spread of diffractive methodologies, its widespread application as a general tool of critique promotes a disregard of what is most essential to the quantum: namely, its "weird" logic, its localized and experimental nature never separate from its measurement apparatus, which must be included in its determination.

---

[311] The famous "Schrodinger's cat" experiment was an attempt to show the absurdity of macro objects operating according to quantum logics. See Unnikrishna, C. S. "The Schrödinger Cat: Physics, Math, and Philosophy," *History of Science and Philosophy of Science: A Historical Perspective of the Evolution of Ideas in Science*6th ed. Vol. XIII, Edited by Debi Prasad Chattopadhyaya and Pradip Kumar Sengupta (Delhi: Pearson, 2010): 313-38. Recent studies have used the cat experiment to develop quantum computing technology; see Zaki Leghtas, et al. "Preparing Schrodinger cat states by parametric pumping," *APS Meeting Abstracts*. Vol. 1. 2014.

[312] For more on this tendency, see Cary Wolfe, "Of Ecology, Immunity, and Islands: The Lost Maples of Big Bend," *Posthumous Life: Theorizing Beyond the Posthuman,* Edited by Jami Weinstein and Claire Colebrook (New York: Columbia University Press, 2017).

Following from this problem of scaling up and down, I want to suggest that there are deep resonances between Barad's diffractive method and Deleuze and Guattari's rhizomatics. In particular, following the flurry of excitement (and concomitant skepticism) over the rhizome as a new form of critique, I argue that its most fundamental feature, namely, the book, was largely cast aside. Likewise, as diffraction spreads across the disciplines as yet another general form of critique (the critique of critique), new material feminists need to hold themselves accountable for making a similar "cut," that is for their elimination of certain entities that they deem to be mere relics of linguistic and social constructivism. In what follows, I propose to reclaim the book for rhizomatics, precisely because I think it offers a route for avoiding the problem of scales, which does not rely on the infinitely small and instead, utilizes the weird. Rhizomatic writing can teach us how to negotiate the language/reality binary that continues to haunt the theoretical humanities; and more specifically, offers new means for local experimentation with feminist (poststructural) writing practices. I will undertake one such experiment in Chapter 4.

## Rhizomatics

In France, readers of the best-selling *Anti-Oedipus: Capitalism and Schizophrenia* (1972), eagerly awaited the arrival of the second volume by collaborators Gilles Deleuze and Félix Guattari. When *A Thousand Plateaus* finally appeared eight years later (1980), it turned out to be a bit of a disappointment in France and was "greeted with relative indifference." Although the reviews were "polite," confusion seemed to be the main theme. Reviewers praised the book as "essential in its dissection of space" and "a philosophical treatise without equal," but at the same time qualified their remarks, calling it also, "baffling," "challenging," and "perplexing." The public seemed to agree: as of 2007, sales of *Anti-Oedipus* more than doubled those of *A Thousand Plateaus.*[313] The pure density of the book, in addition to its lack of unity and historicity, its spatial logics, and its critique of phenomenology and linguistics, seemed to prevent readers from finding any real revolutionary effects within its pages.

*A Thousand Plateaus* was translated into English in 1987, but it was largely rejected by the Anglophone academy.[314] Although their work was initially accused of sophistry and creating concepts that were "as enormous as false teeth," Deleuze and Guattari began, ever so slowly, to take hold in the 1990's only after a small group of Canadians labored to introduce other works to English speakers. Constantin Boundas translated four volumes of Deleuze's single-authored work, and together with Dorothea Olkowski, organized the first international Deleuze conference in 1992. In the same year, Brian Massumi wrote, *A User's Guide to Capitalism and Schizophrenia,* and began publishing his own work on Deleuze and Guattari. In 2001, Gary

[313] See François Dosse, *Gilles Deleuze and Felix Guattari: Intersecting Lives* (New York: Columbia University Press, 2011): 567. This reading is indebted to three texts: François Cusset, *French Theory: How Foucault, Derrida, Deleuze & Co. Transformed the Intellectual Life of the United States*, Translated by Jeff Fort (Minneapolis: University of Minnesota, 2008); François Dosse, *Gilles Deleuze and Félix Guattari: Intersecting Lives* (2011), and Gregg Lambert, *Who's Afraid of Deleuze and Guattari?* (New York: Bloomsbury Press, 2008).

[314] Long before they took hold in the U.S. academy, Deleuze and Guattari's concepts did become popular among artists. In 1975, Sylvère Lotringer, founder of the journal *Semiotext(e),* invited Deleuze and Guattari, as well as Foucault, Lyotard and others, to a symposium at Columbia University on "Schizoculture." Finding relatively no American counterparts to Deleuze and Guattari's work, Lotringer invited American artists John Cage and William Burroughs. On their American tour, Deleuze and Guattari met artists, singers, and writers at the Chelsea Hotel, and attended a Bob Dylan and Joan Baez concert where Allen Ginsburg appeared on stage. When the issue of *Semiotex(e)* on schizoculture appeared in 1976, it sold five thousand copies in three weeks. See Dosse, *Intersecting Lives*, 469.

Genosko edited three large volumes, *Deleuze and Guattari*: *Critical Assessments of Leading Philosophers,* that gathered together nearly all the existent scholarship on Deleuze and Guattari in English.

Nearly absent from American philosophy departments, Deleuze and Guattari's concepts first took hold in literature and film departments. The first texts translated into English, for example, were reinterpretations of literary figures: Proust, Sacher-Masoch, and Kafka; this gave Americans the impression that they were "atypical literary critics."[315] The slim volume on Kafka offered a fresh reading of the Jewish writer. In their hands, Kafka became a joyful, comic writer of "literary machines" who opposed "majoritarian readings," and promoted instead the creation of what they called a "minor literature": "We might as well say that minor no longer designates specific literatures but the revolutionary conditions for every literature within the heart of what is called great (or established) literature."[316] Key to this revolutionary literature was the concept of the rhizome. First introduced in *Kafka* as a burrow and expanded later in *A Thousand Plateaus* as the rhizome, its multiple entries and creative connections seemed to offer a new tool for American literary critics, who since the 1950s had been deeply ensconced in psychoanalytic analysis, but who had also become newly enamored with deconstruction.

As most Deleuze scholars point out, however, the rhizome was never essentially literary. Deleuze insisted that his project had nothing whatsoever in common with Derrida's:

> deconstruction has nothing to do with my own method. I don't really do textual commentary. For me, a text is nothing but a cog in a larger extra-textual practice. It's not about using deconstruction, or any other textual practice, to do textual commentary; it's about seeing what one can do with an extra-textual practice that extends the text.[317]

Literary scholars took him seriously on this, and since the 1990s, generally agreed that what rhizomatics offers is not a textual strategy after all, but a general critique of representationalism and the logic of binary thinking produced by Western rationalism. Literary theorist Ronald Bogue highlights the distinction between the dominant Western or "arborescent" structural mode and the rhizomatic structural mode:

> Arborescences are hierarchical, stratified totalities which impose limited and regulated connections between their components. Rhizomes, by contrast, are non-hierarchical, horizontal multiplicities which cannot be subsumed within a unified structure, whose components form random, unregulated networks in which any element may be connected with any other element.[318]

"Rhizome-thinking," as German literary critic Christa Bürger maintains, opposes the "enemy," that is, the closed linguistic system ruled by the Signifier. As an open-ended system of connection, rhizome-thinking offers a way out of Western rationalism "in all its historical

---

[315] Cusset, *French Theory*, 282-283. Based on the release of Gilles Deleuze, *Proust and Signs,* Translated by Richard Howard (Minneapolis: University of Minnesota Press, 2014); and *Masochism: Coldness and Cruelty,* (New York: Zone Books, 1991) as well as Deleuze and Guattari's, *Kafka: Toward a Minor Literature*, Translated by Dana Polan (Minneapolis: University of Minnesota press, 1986).

[316] Deleuze and Guattari, *Kafka,* 18.

[317] Gilles Deleuze, *Desert Islands and Other Texts: 1953-1974*, Edited by David Lapoujade, Translated by Michael Taormina (Los Angeles: Semiotext(e), 2004): 260.

[318] Ronald Bogue, *Deleuze and Guattari* (London: Routledge, 2005), 107.

manifestations," a tool we can use to "unfix" the what has become stable, but which really belongs to a more fundamental "flow" of thought.[319]

Expanding from the context of literature, "rhizomatics," was scaled up and applied to any number of contexts and disciplines. Fredric Jameson, for one, uses rhizomatics for a Marxian cultural critique, which has been extremely influential for the American version of cultural studies. Combining rhizomatics with the concept of "noology," or "the study of images of thought and their historicity," Jameson provides a viable alternative to Marxist ideology critique, for, as he argues, the concepts offer "a way of judging thought according to its conformity "with a model borrowed from the State apparatus.'"[320] For Jameson, rhizomatics offers a new hermeneutics that, unlike synchronic approaches, does not fall prey to totalizing representations of history.[321]

In the introduction to their edited volume on Deleuze and Guattari, Eleanor Kaufman and Kevin Jon Heller's characterization of the rhizome elegantly captures the broad appeal and seemingly infinite applicability of the rhizome:

> Throughout *A Thousand Plateaus*, Deleuze and Guattari use the rhizome to emblematize a new form of thought and politics that is not trapped in the rigid formations of the state, the unconscious, or language. Instead, the movement of the thought in question is flexible and nomadic, transversal and nonhierarchical; this thought is able to move between the formations the state, the unconscious, or language and not just exclusively within one formation. Like the navigator who in one trajectory uses the metro, the bus, and the foot in combination—thereby integrating a network of bodily and mechanic locomotion into one "assemblage"—a rhizomatic or nomadic thought would forge linkages or connections between different systems of knowledge formation. In this fashion Deleuze and Guattari outline an *expansive cartography of living.*[322]

Rhizomatics was popularized as a flexible mode of thinking that could serve both as a critique of Western rationalism and the foundation for a new politics. As a general tool that could be applied in an unlimited number of contexts, by 1998 rhizomatics and its many "minorizations" had captured the imaginations of scholars in numerous fields—even many feminist and postcolonial scholars, despite an earlier wholesale rejection by influential feminists.[323]

The appeal of the rhizome as a general model for thinking can be measured by the rapid increase of publications in the United States which carried the names "Deleuze and Guattari" in the title: between 1998 and 2000, only five or six volumes appeared, but in 2001 alone, ten titles were published. In the decade that followed, at least eighty volumes appeared with their names in

---

[319] Christa Bürger, "The Reality of Machines: Notes on the Rhizome-thinking of Deleuze and Guattari," *Deleuze and Guattari*, Edited by Gary Genosko (London: Routledge, 2001), 1251-1262.
[320] Buchanan, *A Deleuzian Century?* (Durham: Duke University Press, 1999), 25.
[321] Jameson cites Derrida, Foucault, Lyotard, Baudrillard, and Kristeva as "making this mistake." See Buchanan, *A Deleuzian Century?* And also Paul Bové's foreward, "Translating Theory, or the Difference between Deleuze and Foucault," Gilles Deleuze, *Foucault,* Translated and Edited by Seán Hand (London: Continuum, 1999), vi-ix.
[322] Eleanor Kaufman and Kevin Jon Heller *Deleuze and Guattari: New Mappings in Politics, Philosophy, and Culture* (Minneapolis: University of Minnesota Press, 1998), 4. Emphasis mine.
[323] Luce Irigaray and Alice Jardine, suspicious of concepts like "becoming-woman" and "desiring machines," accused Deleuze and Guattari of "yet another male appropriation." See Luce Irigaray, *This Sex Which is Not One*, Translated by Catherine Porter (Ithaca: Cornell University Press, 1985), 141; Alice Jardine, *Gynesis: Configuration of Woman and Modernity* (Ithaca: Cornell University Press, 1982).

the title in fields as diverse as film and media studies, architecture and urban planning, postcolonial studies, performance studies, animal studies, education and pedagogy, geography, and science studies.[324]

It is not my intention to attribute any directly causal relations, but the timely appearance in 1998 of Charles Stivale's book, *The Two-Fold Thought of Deleuze and Guattari* surely seems in some way to have affected the flurry of publications that followed it. Stivale's book traces his own confusion over encountering Deleuze and Guattari's concepts, and presents his personal path of unpacking them, thus clarifying and demystifying them. Each of his chapters offers a model of how to apply their concepts, a method that relies on what Stivale calls, "radical intertextuality."

Stivale argues that *A Thousand Plateaus* is a "radically intertextual" piece. The introduction, he says, connects to the first volume, *Anti-Oedipus* to the second one, but also connects Deleuze's previously published work to Guattari's, and their previous collaboration, *Kafka: Toward a Minor Literature*. In fact, Stivale continues, the essay also links together other Deleuzian discussions in progress, including *Dialogues* between Deleuze and Claire Parnet, and the burgeoning online discussions among Anglophone Deleuze and Guattari scholars.[325] Stivale attributes profound importance to these online discussions, for these "continuing offshoots and taproot systems" of cyberspace suggest that the rhizome is not merely an analogue for the hyperconnectivity of the internet, but itself constitutes a "hyper" or "radical intertextuality" that transforms the entire world into myriad readable codes. These codes include language of course, but also music, physics, computers, math, political economy, and so on.[326] The term "text," Stivale argues, privileges neither language nor signification in Deleuze and Guattari's essay; rather, "text" should be understood "in the broadest imaginable senses" to encompass all manner of "readable" and interwoven codes.[327]

Stivale's brand of intertextuality was widely embraced in American English, Comparative Literature, and Film and Media Studies departments,[328] and affected what might be called a revolution in reading practices.[329] Following Stivale's lead, a mode of reading signs and sense across disciplines, literary, media and film scholars produced the explosion of texts influenced by Deleuze and Guattari's concepts, including "minor" readings of literary and cultural texts,[330] "aesthetics" and "pragmatics" of reading,[331] examinations of the role of

---

[324] This number refers only to books published with both names in the title, and not to the hundreds of additional journal and book topics which were "Deleuzian" in approach, but don't refer directly to Deleuze in the title. These numbers were no doubt influenced by the appearance of *Deleuze and Feminist Theory*, Edited by Ian Buchanan and Claire Colebrook in 2001 as the first book in the Deleuze Studies Series published by Edinburgh University Press. To date, the series has published nearly 60 volumes; the most recent include *Deleuze and the Animal* (2017), *Deleuze and Guattari in the Anthropocene* (2016), *Deleuze and the City* (2016), *Deleuze and Design (2015)*.

[325] Charles Stivale, *The Two-Fold Thought of Deleuze and Guattari: Intersections and Animations* (New York: Guilford, 1998), 75.

[326] Ibid.

[327] Ibid.

[328] Dosse, *Intersecting Lives*, 476.

[329] For a compelling view of these wrong-headed followers, see Gregg Lambert, *Who's Afraid of Deleuze and Guattari?*, who argues that despite the explosion of interest, "the [Deleuzoguattarian] revolution did not take place."

[330] Baroussa, *Deleuze and American Literature: Affect and Virtuality in Faulkner, Wharton, Ellison, and McCarthy*. New York: Palgrave Macmillan, 2009; Søren Frank, *Salman Rushdie: A Deleuzian Reading* (Kobenhavn: Museum Tusculanum, 2011).

[331] See Marco Abel, *Violent Affect Literature, Cinema, and Critique After Representation* (Lincoln: University of Nebraska Press, 2009); Bruce Baugh, 2000; Bourassa, *Salman Rushdie*; John Hughes, *Lines of Flight: Reading Deleuze with Hardy, Gissing, Conrad, Woolf* (Sheffield:

literature in/for history and politics,[332] and affective analyses of film, media, art, and literature.[333] Since 1998 when Stivale first theorized its radical intertextuality, rhizomatics has emerged paradoxically as a fruitful, interdisciplinary method of "decoding" or reading that fits perfectly well into the framework of literary (Marxist and psychoanalytic) ideology critiques, as it simultaneously frees reading practices from traditional forms of criticism. These lively discussions brought new life to waning literature departments ensconced in psychoanalytic and deconstructive interpretive strategies.[334]

## The Question Concerning the Book

There is a telling moment that appears in Stivale's chapter, "Rhizomatics and Cyberspace," in which he takes pause over the introduction to *A Thousand Plateaus*: "One thing that struck me," Stivale says, "about the opening and closing paragraphs of 'Introduction: Rhizome' is the authors' preoccupation with 'the book.'"[335] Despite his theory of the radical intertextuality of rhizomatics, the book seems to designate something else entirely. If "the book" is indeed distinguished from "the text," then what are Deleuze and Guattari talking about when they use the term, "the book"? Are they referring to the "physical object" of the book, or perhaps the "Great Books of Literature"? Are they talking about *this* book, *A Thousand Plateaus*, which would include the materials it is composed of as well as its means of production, and so on? Or is there a concept of the book (what Stivale calls, "*le livre"*) that would incorporate all of these? The distinction between "text" and "book" in this particular case is not entirely clear, and Stivale does not pursue the question. For his part, Stivale avoids the question of the book and focuses entirely on "the text," which for his purposes, designates a vast and interwoven network of codes and reading practices.

In his "Translator's Forward" to *A Thousand Plateaus*, Brian Massumi also takes note of Deleuze and Guattari's attention to "the book." Massumi says, "this book speaks of many things" but also that "it is difficult to know how to approach it." Warning the reader that this book poses a set of challenges, Massumi asks how one might approach a book that "dedicates a chapter to music and animal behavior—and then claims it isn't a chapter," a book that presents itself as a series of dated chapters that can be read in any order.[336] To compound the confusion, Massumi highlights the broad range of technical vocabulary, the strange combination of elements included

---

Sheffield Academic Press, 1997); Mary Frances Zamberlin, *Rhizosphere: Gilles Deleuze and the "Minor" American Writings of William James, W.E.B. Du Bois, Gertrude Stein, Jean Toomer, and William Faulkner* (New York: Routledge 2006); Colin Davis, *Critical Excess: Overreading in Derrida, Deleuze, Levinas, Žižek and Cavell* (Stanford: Stanford University Press, 2010).

[332] Ronald Bogue, *Deleuze on Literature* (New York: Routledge, 2003); on Frederic Jameson, see Ian Buchanan, *Deleuze and the Contemporary World* (Edinburgh: Edinburgh University Press, 2006): 184 Lambert, *Who's Afraid?* 2006.

[333] Abel, *Violent Affect;* Bourassa, *Deleuze and American Literature;* Felicity Colman, *Deleuze and Cinema: The Film Concepts* (Oxford: Berg, 2011); Patricia Clough and Jean O'Malley, *The Affective Turn: Theorizing the Social* (Durham: Duke University Press, 2007); Garin Dowd, *Abstract machines: Samuel Beckett and Philosophy after Deleuze and Guattari* (Amsterdam: Rodopi, 2007); Gregory Flaxman, *The Brain is the Screen: Deleuze and the Philosophy of Cinema* (Minneapolis: University of Minnesota Press, 2000); Elena del Rió, *Deleuze and the Cinemas of Performance: Powers of Affection* (Edinburgh: Edinburgh University Press, 2012); Patricia Pisters, *The Matrix of Film Culture: Working with Deleuze in Film Theory* (Stanford: Stanford University Press, 2003); Steven Shapiro, *Post-Cinematic Affect* (Winchester: 0 Press, 2010).

[334] Lambert, *Who's Afraid?,* 1-5.

47 Stivale, *The Two-Fold Thought*, 74.

[336] Deleuze and Guattari, *A Thousand Plateaus*, ix.

(ticks, quilts, fuzzy subsets, noology, music and animal behavior, and political economy), and the sheer number of philosophical concepts that contribute to its difficulty.[337] Borrowing from comments made by Deleuze himself,[338] Massumi suggests that readers approach the book like recorded music:

> How should *A Thousand Plateaus* be played? When you buy a record there are always cuts that leave you cold. You skip them. You don't approach a record as a closed book that you have to take or leave. Other cuts you may listen to over and over again. They follow you. You find yourself humming them under your breath as you go about your daily business. *A Thousand Plateaus* is conceived as an open system. It does not pretend to have the final word. The authors' hope, however, is that elements of it will stay with a certain number of its readers and will weave into the melody of their everyday lives.[339]

Massumi recommends that "the best way to approach the book is to read it as a challenge," and he even offers the consolation that *A Thousand Plateaus* will probably not "work" for most readers; if this is the case, they "would have been better off buying a record."[340] Although we know that this book is particularly strange, Massumi merely offers us a method for reading and making sense of it.

It seems clear that Deleuze and Guattari are indeed concerned with books, for the first entry on the "Contents" page reads, "3 Root, radicle, and rhizome—Issues concerning books." They, too, seem to feel the need to offer advice on reading their strange book that was written by "quite a crowd."[341] They acknowledge the book's difficulties, maintain a self-reflexive attitude as they reveal its oddities (e.g., "We are writing this book as a rhizome"; "Each ring has an imaginary date and an illustration. It is an illustrated book"), admit to its failures (e.g., "…we only know of rare successes of this. We ourselves were unable to do it"[342]), and finally, present a kind of reader's guide for approaching it (e.g., "It's like a set of split rings. You can fit any one of them into any other"; "Each plateau can be read starting anywhere and can be related to any other plateau"[343]).

Neither Stivale nor Massumi venture an explanation or justification for what they notice as Deleuze and Guattari's "preoccupation" with the book. However, their concern for the book, I will argue, should not be underestimated. Although there has been much treatment of Deleuze's method of intensive reading or "reading with love," very little has been said about "the book."[344]

---

[337] Massumi's advice: "the desired result is systematic openness" and "The important thing…is to extract [concepts] from their usual connections to other concepts in their home system and confront them with the example or a detail from it. The activity of the example will transmit to the concept, more or less violently. The concept will deviate under the force. Let it. Then reconnect it to other concepts, drawn from other systems, until a whole new system of connections starts to form." See *Parables of the Virtual*, 18-19.

[338] Gilles Deleuze, *Dialogues* (Paris: Flammarion, 2008) and *Negotiations: 1972-1990*, Translated by Martin Joughin (New York: Columbia University Press, 1997).

[339] Deleuze and Guattari, *A Thousand Plateaus*, xiv.

[340] Ibid., xv.

[341] Ibid., 3.

[342] Ibid., 22.

[343] Deleuze, *Negotiations*, 25.

[344] Deleuze says, "I saw myself as taking an author from behind and giving him a child that would be his own offspring, yet monstrous. It was really important for it to be his own child, because the author had to actually say all I had him saying. But the child was bound to be monstrous too, because it resulted from all sorts of shifting, slipping, dislocations, and hidden emissions that I really enjoyed." See Deleuze, "Letter to a Harsh Critic," in

In the following section, I will outline the six characteristics of the rhizome, but not to show how they effectively offer a general critique of Western rationalism, nor even as a method of "reading with love."[345] Rather, I want to suggest that rhizomatics poses an altogether different question, the question of "the book" as a problematic field. In questioning "the book," Deleuze and Guattari are not simply referring to the book at hand, nor to literary texts, nor even to a prescribed set of reading practices for this (or any other) book. Rather, I want to argue that the question of "the book," as it is developed *A Thousand Plateaus* (as well as in *Kafka* and elsewhere), is identified by Deleuze and Guattari as a real problem, and further, and that their creative response to the problem of the book is to provide a new image of thought of the book.[346]

## Against Interpretation

As Massumi noted, asked how the plateaus are arranged, Deleuze responds in an interview, "It's like a set of split rings. You can fit any one of them into any other. Each ring, or each plateau, ought to have its own climate, its own tone or timbre."[347] Given that relations among "chapters," "plateaus," or "rings" are nonlinear, or "rhizomatic," it seems that the reader has both an obligation to interpret its signs, and the right to take from the system "whatever works" for him or her, and to connect it with other systems. This would also support Stivale's method of interpreting across different codes and connecting them.

However, the rest of the interview reveals Deleuze's approach to the book, *A Thousand Plateaus* as particularly philosophical: "It's a book of concepts. Philosophy has always dealt with concepts, and doing philosophy is trying to invent or create concepts."[348] In contrast to the view that the different plateaus offer different interpretations or use-values, Deleuze insists that it is this book's philosophical qualities that are crucial to understanding "the book." Deleuze points out repeatedly that they are "not trying to interpret." Asked about the genre of *A Thousand Plateaus*, Deleuze replies, it is "philosophy. Nothing but philosophy."[349] What, then, is a philosophical book doing? What is it capable of? As a book of philosophy, Deleuze insists, this book is doing something different from the books we interpret.

While *A Thousand Plateaus* is certainly a challenging read, its main concern is not with interpretation, and the authors are quite adamant about that. Interpretation follows a circular logic and always returns to underlying universals. It is an act of deception, they argue, for interpretation only ever "carried to infinity and never encounters anything to interpret that is not already itself an interpretation." They characterize interpretation as a futile performance of "the subject, who jumps from one circle of hell to the next."[350] In *Kafka*, Deleuze and Guattari list the various ways of reading that inevitably return acts of reading to underlying universals, or what they call, "interpretosis":

---

*Negotiations*, 6. For more on this, see Daniel Smith (Edinburgh: Edinburgh University Press, 2012), Colin Davis *Critical Excess*; Slavoj Žižek, *Organs without Bodies on Deleuze and Consequences* (London: Routledge, 2012).

[345] Charles J. Stivale, *Gilles Deleuze's ABCs: The folds of friendship* (Baltimore: Johns Hopkins University Press, 2010).

[346] It is worth noting that other French philosophers were concerned with "the book." For example, Jacques Derrida in *Of Grammatology* (1967) thinks about the end of the book and the beginning of writing; Maurice Blanchot in *The Book to Come* (1959) considers the future of writing and the book.

[347] Deleuze, *Negotiations*, 25.

[348] Ibid.

[349] Interview with Catherine Clément, *L'Arc*, no. 49 (1980): 99.

[350] Deleuze and Guattari, *A Thousand Plateaus*, 114.

> We aren't looking for archetypes that would represent Kafka's imaginary; we aren't looking for free associations; we aren't even trying to interpret, to say this means that. And we are least of all looking for a structure with formal oppositions and a fully constructed Signifier; one can always come up with binary oppositions and bi-univocal relations.[351]

A reading practice "is stupid," they argue, if it relies on any transcendent element to make sense of the text: one can't see "where the system is going to and coming from, how the system becomes, and what element is going to play the role of heterogeneity."[352]

Stivale's reading of rhizomes as "radical intertextuality" at first appears to conform to their anti-interpretation model. Arguing that "text" should be considered in the broadest sense, Stivale's practice of connecting the book to other codes outside the text is what he calls a practice of "animating" the text that "intervenes on the reading activity."[353] However, any intervention on interpretation is severely limited by his metaphor of rhizomes as networked computer systems. Once the world becomes code, we are plunged into the very "circle of hell" that Deleuze and Guattari describe. For as code, the primary mode of engagement with the entire world becomes limited to the act of decoding signs, symbols, and sense for the purposes of producing meaning.[354] As Donna Haraway insists, "The codes of the world are not still, waiting to be read. The world is not raw material for humanization."[355]

Intertextuality thus involves not only the reduction of the world to a neural network which, according to Deleuze, maintains a simple system of feedback, but also reduces the "witty world" to a passive surface. Deleuze and Guattari's rhizome is quite different from a cognitive neuroscience model.[356] Radical intertextuality places the book and the world in the limited realm of interpretosis as a series of feedback loops. Rather than closed systems, Deleuze and Guattari's rhizome can take various forms (roots, burrows, swarms, and so on), but what distinguishes the rhizome most is its openness. Critical of the closed interpretive circles, Deleuze and Guattari seek instead the "departure points" in a book, or anything that could be the site of a carrying away into something else. Deleuze and Guattari are trolling for becomings.

One of these departure points, according to Michel Pierssens, is to view the operations of the book itself as a complete departure from "literarity." We should view the work, Pierssens says, as a "precise and crazy operation…, a departure point."[357] Literature's operations engage with works and texts. However, Deleuze and Guattari note that *A Thousand Plateaus* "is composed not of chapters but of 'plateaus.' We will try to explain later on (and why the texts are

---

[351] Deleuze and Guattari, *Kafka*, 7.
[352] Ibid.
[353] Stivale, *The Two-Fold Thought*, 8.
[354] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," *Feminist Studies*, Vol 14 (Autumn 1988): 575-599. Haraway critiques the metaphor of a "textualized and coded world" in which rational knowledge is a process of "ongoing critical interpretation" among "fields of decoders."
[355] Ibid., 590.
[356] See Gilles Deleuze, *Cinema 1: The Movement-Image*, Translated by Hugh Tomlinson and Barbara Habberjam (London: Continuum, 1986), 59-63. See also Flaxman, *The Brain is the Screen*; John Rajchman, *The Deleuze Connections* (Cambridge: MIT Press, 2000), 11: "Today Deleuze's language of connection, rhizome, network may well sound like talk of neural nets or internets, but one must proceed with caution. For he in fact rejected the computer model of the mind."
[357] 1973, quoted in Stivale, *The Two-Fold Thought*, 8.

dated)."[358] By departure points, Pierssens does not refer to the text as being open to many interpretations; rather, Deleuze and Guattari suggest a more radical departure point from the literary operations normally performed on "the text." Deleuze and Guattari's "preoccupation with the book" indicates that they are concerned with a different kind of book altogether.

Since literary references are present everywhere in Deleuze's work, many have inquired into the precise role of literature for Deleuze's philosophy. The answers differ little, each describing a range of relations between philosophy and literature. Anne Sauvagnargues suggests that philosophy has literary qualities.[359] François Dosse suggests these qualities are useful for experimentation.[360] Dosse also quotes Deleuze as saying that "a book of philosophy should be in some small measure a very particular variety of detective novel."[361] Ronald Bogue characterizes much of Deleuze's writing on literature as "a thinking-alongside literary works, an engagement of philosophical issues generated from encounters with literary texts."[362] Daniel Smith suggests that literature is useful in the philosophical work of creating concepts.[363] Each of the answers to the question of literature's role in Deleuze's work presumes the relative proximity between philosophy and literature. In distinction to this model of proximity that, I argue, takes yet again their "separation too literally," I propose instead that Deleuze and Guattari "Rhizomes" essay does not attempt to mediate between the two fields, philosophy and literature, but rather, presents an altogether different mode of engagement through a new image of thought of the book. While "the book" is currently imprisoned in the classical or literary image of what a book is (i.e. a text bound up in circles of interpretation), the would-be rhizomatic book departs from that classical image. It moves away from the passive state of a text "being read," toward an active state in which *writing* operates as an intervening double act of critique/creation. This is an image of thought of the book that lies completely outside of "literariness." In short, writing can manage the requisite movements of the "open book" that creates concepts in a way that the closed interpretive mode of the literary text simply cannot.

Deleuze and Guattari characterize these opposing modalities of the book as the classical or root-book, defined by subjectification, signification, and organicity; the radicle or fascicular figure of the book, a mere disguised copy of the root book; and the book that "has the characteristics of the rhizome."[364] Rhizomatics offers a new image of thought of the book, and thus a new mode of approaching what a book can *do*.[365]

We are now in a position to see that the book, as Deleuze and Guattari reconceive of it in "Rhizomes," is neither a simple physical object, nor a literary work birthed by an author, nor a text to be interpreted by a reader. To consider the book in any of these senses would amount to a return to the classical image of the book (either root or radical version), which leads us back to the enemies of signification, subjectification, and organicity. Deleuze and Guattari ask us to consider, "What is the body without organs of a book?" What would be the contours of such an "open book," so to speak? Rather than simply presenting a new book in opposition to the old

---

[358] Deleuze and Guattari, *A Thousand Plateaus*, xx.
[359] Anne Sauvagnargues, *Deleuze and Art*, Translated by Samantha Bankson (London: Bloomsbury Press, 2016).
[360] Dosse, *Intersecting Lives.*
[361] Ibid.
[362] Bogue, *Deleuze on Literature*, 2.
[363] Daniel Smith, "Introduction: "A Life of Pure Immanence": Deleuze's 'Critique et Clinique' Project," in Gilles Deleuze, *Essays Critical and Clinical* (Minneapolis: Minnesota University Press, 1997), xi-lv.
[364] Deleuze and Guattari, *A Thousand Plateaus*, 7.
[365] Deleuze is fond of investigating the Spinozist question of "what a body can do." See *A Thousand Plateaus,* 257; Deleuze and Guattari, *Anti-Oedipus,* "On the production of the body without organs," and Deleuze, *Spinoza.*

one, I want to suggest further that Deleuze and Guattari reconceive of "the book," not as one method among many for approaching a book (i.e., one for literature, and one for philosophy), but more significantly, for approaching the book as what Deleuze calls "a true problem."

## Deleuzian Problems and the Image of Thought

In their attempts to "bring the material back in" to feminist theory and practice, new material feminists seek to deconstruct the binary between language and reality. The problem of language for new materialism has proven to be incredibly stubborn. I suggest that its stubbornness is due to the fact that the problem of language is not a simple one, but is rather more along the lines of what Deleuze called a problematic field. The "true" problem, according to Deleuze, not only lacks ready solutions, but it is also a problem that never goes away. The true problem has no solution, or rather, "deserves the solution it gets."[366] Deleuzian problems are not unified, but exist as a field of tensions; any given solution merely transforms the problematic tension, which is to say, it also alters the conditions for future responses to it. In other words, the problematic field doesn't go away, but it generates new conditions for learning and responding to that problem.[367] I propose that language is just such a problem for new materialism. Rather than simply creating a new theory, concept, or "settlement" that will help us understand our world, once and for all,[368] I suggest that a treatment of language and its relations requires a creative response that will, in turn, alter the texture of the problematic field of those relations.

All thought is restricted by the limitations of its particular "images of thought," according to Deleuze, that is, by the set of presuppositions about the form thought should take.[369] Later, in Deleuze and Guattari's last collaboration, *What is Philosophy?*, they write that the image of thought is "the image thought gives itself of what it means to think."[370] It is the image thought gives itself so that it may "find its bearings," so that it may have meaning; it is also what is given to thought "by right," *quid juris*. An image of thought is not merely the starting point for any given philosophy—which always begins from a *milieu*—but a particular orientation toward thinking. The construction of philosophical concepts takes place against the background of the presuppositions it "deserves," and as such, "always has the truth that falls to it as a function of the conditions of its creation."[371]

The process of selection is key to creating any concept. Its construction takes place not against its relation to truth, but rather, in relation to its "selection." Traditionally, philosophy "begins" by selecting a foe, a negative image of thought against which it might direct itself (e.g., error, superstition, ideology). But a "nonreactive" image of thought (following Nietzsche), would not seek a foe, according to Deleuze and Guattari; rather, selection refers to the conditions for the emergence of a new image of thought. And an undogmatic image of thought would seek neither origins nor relations to truth, since "philosophy is constructivist and entails two complementary operations: creating concepts and laying out a plane." Philosophy is also "becoming, not history," since the great philosophers don't repeat what others have said; they do not use ready-made concepts from the past. Rather "every great philosopher lays out a new plane of

[366] Deleuze, *Difference and Repetition,* 159.
[367] See Deleuze, *Difference and Repetition*, 157-167.
[368] Following Latour, Hekman recommends finding "a new settlement that better describes our situation," *The Material of Knoweldge*, 8.
[369] Ibid., 129-139.
[370] Gilles Deleuze and Félix Guattari, *What is Philosophy?* Translated by Hugh Tomlinson and Graham Burchell (New York: Columbia University Press, 1994), 37.
[371] Ibid., 27.

immanence, draws up a new image of thought."[372] As becoming, philosophy attempts to make new forces visible, to formulate problems according "to our time,"[373] and to incite experimental thinking that can respond to our problems. Images of thought are not merely the ground of thinking, nor relations to truth; they indicate a trust in the world from which thinking derives and in which it becomes effective: "If one concept is 'better' than an earlier one," Deleuze and Guattari argue, "it is because it makes us aware of new variations and unknown resonances, it carries out unforeseen cuttings-out."[374]

It is just these new variations and unknown resonances that Deleuze and Guattari seek in their creative response to our very limited notions of both what the book *is* and what it can *do*. A new image of thought of the book would therefore be an "image without image," precisely because it emerges neither in opposition to the dogmatic image of the book, nor establishes a stable ground on which to return. In a new image of thought of the book, there are no presupposed subjects (author, critic, audience, reader) or objects (genre, narrative, syntax, plot, chapter) that would determine in advance a point of arrival or departure. It as an image of thought without presupposition—*it is presuppositionless*; it is the plane of immanence. "The plane of immanence," write Deleuze and Guattari, "is not a concept that is or can be thought but rather the image of thought, the image thought gives to itself of what it means to think…"[375] To construct the book's immanent image of thought would mean to give that there are no presuppositions as to what the book is, who its subjects and objects are, what it does, or who is involved with it. There is no presupposed limit to the book. Instead, the book "touches the Outside." They insist that, "the outside has no image, no signification, no subjectivity." We should view the book "as assemblage with the outside, against the book as image of the world."[376]

Deleuze and Guattari seem to imply that the rhizome is the book's new image of thought, that is to say, they imagine a "rhizome-book"—but they only use the term once, and near the end of the essay. If the rhizome-book is never named again, then this is because the rhizome is not prescriptive; it must be constructed anew, each time. They critique the dominant image of thought of the book, the classical book, and present a new image, the rhizomatic "image without image," which must be forged because it does not yet exist. But neither can we simply return to this rhizome-book again and again, in the way that one can return to the literary work or text, for it is experimental and non-repeatable.

Roughly the first half of "Rhizome: Introduction" elaborates the relation between root-books and "the rhizome." This is not in an effort to create a new binary distinction between root and rhizome, of course, but rather, to emphasize the dual movement of critique and construction, and the necessity of creating such a book that might be called "rhizome-book." Deleuze and Guattari present six characteristics of a rhizome and they numbered and outlined one or two at a time. Briefly, they are: *connection and heterogeneity*: "any point of a rhizome can be connected to anything other, and must be"; *multiplicity*: all multiplicities are flat, in the sense that they fill all of their dimensions and are defined by the lines that connect them, they have neither subject nor object, only magnitudes; *asignifying rupture*: a rhizome can be broken at any point, and start up again along old lines or new ones; *cartography and decalcomania*: rhizomes don't follow the

[372] Deleuze and Guattari, *What is Philosophy?,* 35-50.
[373] Ibid., 27.
[374] Ibid., 28.
[375] Ibid., 37.
[376] Deleuze and Guattari, *A Thousand Plateaus*, 23.

logic of representation, of tracing or deep structure, but are maps oriented toward experimentation, they are susceptible and connectable in all of their dimensions.

Each characteristic of a rhizome outlines one aspect for the creation of a new image of thought. The first two principles of a rhizome—*connectivity* and *heterogeneity*—critique hierarchical linguistic models. Opposing Weinreich's heterogeneous reality of language to Chomsky's binary one, they set the stage for their concept, the "collective assemblage of enunciation," a concept that breaks with our indebtedness to the hermeneutic points of the classical book: subjects, authors, and readers. Against subjectification, which assumes that the author and reader are fixed and separate subjects with the power to unify the book, a collective assemblage of enunciation breaks with the privileging of language as representation as well as the notion of an author as its subject of enunciation. Any semiotic chain, they implicitly argue, connects not only to its own code of signs, but forms assemblages with others, in other dimensions, and on other registers, to "diverse acts that are not only linguistic, but also perceptive, mimetic, gestural, cognitive."[377] The rhizome brings the multiple into play, and views both language and the book as an open rather than a closed system: "Any point of a rhizome can be connected to anything other, *and must be.*"

*Heterogeneity* signals the new ontological relation between those entities in such an assemblage. While the rhizome may bring many entities into play, they don't preexist. The characteristic of heterogeneity maintains the ontological distinction of entities as emergent from the process of continuous variation. The is clearly reminiscent of Deleuze's early work, *Difference and Repetition* (1968), in which he opposes the history of the concept of difference to his construction of the concept of difference-in-itself, or pure difference, that does not presuppose the concept of identity.[378] In this perspective, the rhizome-book marks connections (and ruptures, as we see below) not between "things," but across the continuous variations of difference.

The third principle of a rhizome is *multiplicity*, something modern literature has yet to achieve, according to Deleuze and Guattari. Known for fragmentation, pastiche, and polysemy, for example, Burroughs's "cut-up method," Joyce's "proliferating text," and Nietzsche's "aphorisms," modernist literature seeks to challenge the unity and organicity of the classical book. And yet, Deleuze and Guattari argue, these modernist authors dodge unity only momentarily; ultimately the authors, or "*doctores anglici,*" reinstate a Higher Unity, one that lies either in the past or remains in the "yet to come."[379] A multiplicity must be made, Deleuze and Guattari claim, but we don't achieve the multiple simply by adding more (n+1). Modernist texts like those of Burroughs, Joyce, and Nietzsche fragment the text, chop it up into little pieces of meaning and declare it a multiplicity. However, Deleuze and Guattari show that modernist pieces always harbor a secret unity in its demand for the reader to reinstate unity to the text. True multiplicities do not operate by addition, but by subtraction. To form a rhizome, we seek "that

---

[377] Deleuze and Guattari, *A Thousand Plateaus*, 7.

[378] In *Difference and Repetition*, Deleuze seeks an affirmative notion of difference—something philosophy has not yet achieved: how to determine difference without defining it in terms of identity or representation? Against Plato (difference from an ideal), Aristotle (difference as that which defines divisions within being), Leibniz (differences as infinitely small) and Hegel (difference as the expanding process of contradiction and synthesis), Deleuze offers "difference-in-itself" or "pure difference" as "the condition for change in actual things."

[379] Deleuze and Guattari, *A Thousand Plateaus*, 6. Elsewhere, Deleuze favors the work of these same writers: on Burroughs, see *Anti-Oedipus;* on Nietzsche see "Nomad Thought" and *Nietzsche and Philosophy*; Joyce, see *Proust and Signs*, 138 and *Kafka*, 19.

from which the One is always subtracted out,"[380] or the element that would claim or reinstate unity. The role of rhizome-book, then, is to subtract out any transcendent dimension that threatens to operate as the unifying element.

How, then, to construct an open system for the book, one that does not merely appear to break unity, only to return to it? Deleuze and Guattari turn to mathematicians Pierre Rosenstiehl and Jean Petitot who propose an open system of multiplicities that rejects any centralizing or unifying element as "asocial intrusion."[381] These a-centered systems always operate at "*n*-1."[382] Using the formula of subtraction, the multiple is built by subtracting out the unifying element, to make us "aware of new variations." It is this very type of subtraction that Deleuze and Guattari call Kafka's "sobriety." The point for them is not simply that Kafka's language is "sober" (although it is, in a certain sense, as a Jew living in Prague and writing in German, the bureaucratic language), but more to the point, it is that Kafka's language is not drunk on itself, that is, not saturated in a closed system of language. The sobriety in Kafka's book lies in the fact that language alone is not the focus; rather the book is opened up to the outsides of both language and literature.[383] In each case, Deleuze asks, "how can thought shake off its model, make its grass grow?"[384]

The next characteristic of a rhizome, *asignifying rupture*, does not refer specifically to the breakdown of meaning in language (it is not "non-signifying"). This understanding returns us to signification and the closed system of language once again. Nor does a-signification merely entail the clean break between connections ("rupture"). Asignifying rupture refers to the fact that any lines in a rhizome always tie back to others, and must, for its lines draw its relation to an outside, to difference, and thus require a certain "intimacy as the Outside."[385] If Deleuze and Guattari name Spinoza as the "Prince of Philosophers" in *What is Philosophy?*, it is because he is the only philosopher who could create this situation: the "purest, the one that does not hand itself over to the transcendent or restore any transcendent."[386] All movements are caught up in one another; heterogeneity necessitates a relation to the outside, and it does so by means of lines. "A book," they insist, "exists only through the outside and on the outside."[387] In *The Trial*, Kafka's lines draw "a unity so nebulous…that there is no longer any difference between being outside or inside" and the indistinction of inside and outside "leads to the discovery of another dimension."[388] The movement to the Outside must not be stopped, for "transcendence enters as soon as movement of the infinite is stopped."[389] Plants know this best: "even when they have roots, there is always an outside where they form a rhizome with something else—the wind, an animal, human beings."[390]

The book remains in contact with the Outside through lines, both segmented or molar lines ("clear-cut," with "delimited segments") and supple or molecular lines ("a supple flow marked by quanta that are like so many little segmentations-in-progress grasped at the moment

---

[380] Deleuze and Guattari, *A Thousand Plateaus*, 21.
[381] Ibid., 17.
[382] Ibid., 6.
[383] See Deleuze and Guattari, *Kafka* 16 and Deleuze and Guattari, *A Thousand Plateaus.*
[384] Deleuze, *Dialogues II,* 18.
[385] Deleuze and Guattari, *What is Philosophy?,* 59.
[386] Ibid., 60.
[387] Deleuze and Guattari, *A Thousand Plateaus*, 4.
[388] Deleuze and Guattari*, Kafka*. 8
[389] Deleuze and Guattari, *What is Philosophy?,* 47.
[390] Deleuze and Guattari*, A Thousand Plateaus*, 11.

of their birth, as on a moonbeam, or on an intensive scale"). These two types of lines are constantly interacting with one another, introducing rigidity and fluidity upon each other in turn.[391] But there is also a third type of line: the line of flight, the abstract line "is a very complex one," according to Deleuze. This line "doesn't mark a contour of anything, but instead passes between things—a mutant line." It is "the most living and creative of lines."[392] The English translation of *fuite* into "flight" is misleading, for the French term connotes not flight, but elusiveness. Not unlike the vanishing point of a painting, it implies a disappearing into the distance.[393] Since lines of flight in a book do not refer to language alone, this elusiveness should not be mistaken for the indescribable or ineffable; this is not a reference to the lack of correspondence between words and things, nor to vagueness or imprecision of language to capture reality. Lines of flight are also not so much paths of escape, but more like the suspension or interruption of prescribed requirements. A line of flight implies a movement in connection with the outside that engages along new vectors:

> To write is certainly not to impose a form (of expression) on the matter of lived experience…Writing is a question of becoming, always incomplete, always in the midst of being formed, and goes beyond the matter of any livable or lived experience.[394]

In this way, writing is an experimental engagement of the book with its outsides. Lacking prescription and prior knowledge and experience, the abstract line heads out into the distance and "blazes a new trail."[395]

The fifth and sixth characteristics of a rhizome, *cartography and decalcomania*, introduce methods for drawing and following these lines. Decalcomania, or "tracing," operates on the level of extensivity and actual things, and it follows the principles of representation: identity, analogy, opposition, and resemblance. Tracing "describes a *de facto* state" and works to "organize, stabilize and neutralize" according to the axes of subjectification and signifiance.[396] Tracing draws lines between points, that is, between pregiven entities or actualized states:

> The cultural book is necessarily a tracing: already a tracing of itself, a tracing of the previous book by the same author, a tracing of other books however different they may be, an endless tracing of established concepts and words, a tracing of the present, past, and future.[397]

On the other hand, "cartography," or "mapping," involves following the intensive processes that give rise to actual things or becomings. Mapping is "altogether different" than tracing; maps are susceptible and connectable in all of their dimensions. The map is different from a tracing in that it is "entirely oriented toward an experimentation in contact with the real. It fosters connections between fields, the removal of blockages on bodies without organs…"[398] Deleuze and Guattari's rhizomatic book opposes the cultural book:

---

[391] Deleuze and Guattari*, A Thousand Plateaus*, 195.
[392] Interview with Catherine Clément, *L'Arc* no. 49 (1980): 99.
[393] According to Massumi, the word *fuite* "has no relation to flying." See *A Thousand Plateaus*, xvi.
[394] Deleuze, *Essays Critical and Clinical*, 1.
[395] Massumi, *A Thousand Plateaus*, xviii.
[396] Deleuze and Guattari, *A Thousand Plateaus*, 13.
[397] Ibid., 24.
[398] Ibid., 12.

> …a book composed of chapters has culmination and termination points. What takes place in a book composed instead of plateaus that communicate with one another across microfissures, as in a brain? We call a "plateau" any multiplicity connected to other multiplicities … in such a way as to form a rhizome. We are writing this book as a rhizome.[399]

To attain the multiple and to write the rhizome-book, "one must have a method that effectively constructs it."[400] But Deleuze and Guattari caution us, not to form another dualism between the tracing and map, for the "*the tracing should always be put back on the map.*"[401] Decalcomania and cartography are not two opposed models: the first operates as a transcendent model and tracing, even if it engenders its own escapes; the second operates as an immanent process that overturns the model and outlines a map, even if it constitutes its own hierarchies, even if it gives rise to a despotic channel. The asymmetrical relation between tracing and mapping emphasizes that a model is perpetually in construction or collapsing, and engaged in a process that is perpetually prolonging itself, breaking off and starting up again. Even impasses, when folded back into the rhizome, can offer new ways out. In asking how to "enter" Kafka's work, Deleuze and Guattari answer:

> We will enter, then, by any point whatsoever; none matters more than another, and no entrance is more privileged *even if it seems like an impasse*… We will be trying to discern what other points our entrance connects to, what crossroads and galleries one passes through to link two points, what the map of the rhizome is and how the map is modified if one enters by another point.[402]

Entirely susceptible to its outside, the rhizome is always capable of forming new connections—even via impasses. It's a matter of finding the lines: "How can the book find an adequate outside with which to assemble in heterogeneity, rather than a world to reproduce?"[403] The rhizome-book "is alliance, uniquely alliance."[404] Released from its "Spiritual," that is, unifying tendencies, the book has been transformed: no longer a readable and infinitely connectable network of pre-existent nodes, the book is now "only lines," lines that head out into the desert of thought in order to redraw its contours. This book emerges from the cracks, an experimental mapping of multiplicity in both signifying and non-signifying ways.

With this perspective of the rhizome-book in mind, we can begin to understand why Deleuze and Guattari would propose that the new image of thought of the book involves a *pragmatics of writing*.[405] Deleuze and Guattari contend that Anglo-American writers in particular understand the rhizomatics of writing since they treat it as a *pragmatics*.[406] "America is a special case…everything that has happened or is happening takes the route of the American

---

[399] Deleuze and Guattari, *A Thousand Plateaus*, 22.
[400] Ibid.
[401] Ibid., 13.
[402] Deleuze and Guattari, *Kafka*, 3.
[403] Deleuze and Guattari, *A Thousand Plateaus*, 24.
[404] Ibid., 25.
[405] "Pragmatics becomes the presupposition behind all of the other dimensions and insinuates itself into everything." See Deleuze and Guattari, *A Thousand Plateaus*, 78.
[406] Ibid., 25.

rhizome…"[407] For these writers, and they're thinking here of Hardy, Melville, Stevenson, Woolf, Fitzgerald, Miller, Kerouac, what's important is what does and doesn't work in *this* concrete situation—they're always in the middle of things; they are pragmatists.[408] Writing, as an alternative to the text or the work, is pragmatic in the sense that it does not have an end goal in mind, but it starts in the middle of things. If there is a "finality" to writing, it is "to become" and "to become unknown," that is, to "suspend" or "interrupt" the hard and fast borders of subjectification, signification, and organicity just long enough to forge new lines.[409]

Deleuze and Guattari are not saying, however, that writing and the book are identical, or even analogous. Rather, they seem to be saying that rhizomes concern the pragmatics of writing, and this offers a new image of thought of the book, as distinguished from (but not opposed to) the classical image of thought of the book. The rhizomatic book requires recognizing and altering the presuppositions involved in our understanding of what a book *is*, as well as our understanding of what a book can *do*.

Rhizomatics thus involves not only critique of the old image, but also the creation of a new one. Deleuze and Guattari provide the conditions for the emergence of a new image of thought of the book, one that they are nevertheless hesitant to call a "rhizomatic book."[410] Giving the book a "name" runs the risk of introducing subjectification (by means of a genius author-creator), signification (correspondence and fixed meaning), and organicity (unity and wholeness of meaning). If they critique and create, they must resist the temptation of reintroducing and repeating the old image of thought, a repetition of the same. It is for this reason that Deleuze and Guattari offer the contours for a new orientation in thought, the six characteristics of the would-be rhizome-book that exists *in writing*. Hence the injunction: "Write to the *n*th power … make rhizomes, not roots!"[411]

Given this, let me try to characterize a bit more precisely the difference between these two images of thought of the book in terms of how each book *organizes itself* and what each can *do*. At every turn, Deleuze and Guattari distinguish the book-as-text from the book-as-writing. First, the image of the book-as-writing is fundamentally philosophical, rather than literary. In *What is Philosophy?* they characterize writing as an activity that "needs to be taken up by someone with a particularly sensitive ear for the distant philosophical harmonics of concept creation."[412] Again, Deleuze turns to Spinoza, the king of philosophers, who wrote "one of the greatest books in the world," and what Deleuze calls, a "book of fire." Spinoza's *Ethics*

---

[407] Deleuze and Guattari, *A Thousand Plateaus*, 19.

[408] The relation between Deleuze and Pragmatism can be seen in *Difference and Repetition*. It has often been noted that his "superior empiricism" is a radical pragmatism, in the sense of William James. Isabelle Stengers notes this time and time again (see *Thinking with Whitehead*). Also see David Lapoujade, *Aberrant Movements: The Philosophy of Gilles Deleuze* (Los Angeles: Semiotexte/SmartArt, 2017); Éric Alliez, *The Signature of the World, Or, What Is Deleuze and Guattari's Philosophy?* Translated by Eliot Ross Alberto Toscano (New York: Continuum, 2005).

[409] Deleuze, *Dialogues II,* 34.

[410] Deleuze and Guattari have kept their names as authors, "out of habit, purely out of habit." But also have assigned "clever pseudonyms to prevent recognition." In other words, names are useful for certain things ("it's nice to talk like everyone else"), but when the writer's aim is to "become unrecognizable," names get in the way, returning us to the classical image of thought of the book. Deleuze and Guattari "hesitate" to name the new book a "rhizome-book," I argue, because they are running along a line of flight here, which requires a suspension or interruption of prescribed requirements. In *What is Philosophy?,* they distinguish between two proper names, one as a mask, the other as the singular name of a conceptual persona "who haunts a plane of consistency," *A Thousand Plateaus*, 24.

[411] Deleuze and Guattari, *A Thousand Plateaus,* 25.

[412] Deleuze and Guattari, *What is Philosophy?,* 7-8.

"distinguishes between signs and concepts," Deleuze says, treating signs and affects as merely secondary forms of expression. The primary form of expression is conceptual, and the kind of knowledge constituted by the *Ethics* "is hardly a knowledge" at all, "but rather an experience," and it involves "the selection of affects [as] the very condition [to] attain the concept." This selection is "extremely difficult," he continues, but is "the primary condition for the birth of the concept."[413] Spinoza's book of fire is exemplary of the book-of-writing, a primarily philosophical book organized around selection and the logic of the concept.

We might say, then, that the classical book is traditionally literary; as such, it goes by names of the "text" or "work." The book-as-text operates by means of organicity, signification and subjectification. On the other hand, an alternative book, what Deleuze and Guattari tentatively call the rhizome-book, goes by the name of "writing." As philosophical, writing operates by means of the six characteristics of a rhizome: connectivity, heterogeneity, multiplicity, asignification, cartography and decalcomania. Writing is irreducible to the text or the work. Although any given text is technically also "written," its main mode of engagement is not writing, but *reading*. It is composed of a closed system of linguistic signs; it contains ideology; it is created by an author. Only the rhizome-book's mode of being is "to write," in the infinitive. This is because "to write" has nothing to do with "the author," who strictly belongs to the text. Instead, "to write is to become," Deleuze and Guattari explain, "it has nothing to do with becoming a writer. That is to become something else."[414] While the aim of both the author and the text is to become known, that is, readers make sense of the text through interpretation, and the author is known as a subject, the aim of writing, on the other hand, is to become "unknown," or to become imperceptible: "Oh no, a writer cannot wish to be 'known,' recognized…. To be unknown at last." (34). A writer becomes unknown by "betraying" his loves, first and foremost, "the black hole of our own Ego," which is tied to signification and subjectivity:

> [W]hether it was Hume, Spinoza, Nietzsche, or Proust, or whether it is Foucault—you did not treat them as authors, that is as objects of recognition, you found in them these acts of thought without image, blind as well as blinding, these violences, these encounters, these nuptials which make them creators well before they are authors.[415]

As opposed to the author of the book-as-text, the book-as-writing does not involve the writer, someone who recounts his memories and travels, loves and griefs, or dreams and fantasies. "This is an infantile conception of literature," Deleuze says, which conforms to the Oedipal structure, the "eternal mommy-daddy-me" that inevitably reconstitutes the father.[416] In order for a writer "to write," one must "experiment, never interpret." Henry James is an exemplary writer in this respect because he constructs "a living experiment to which interpretation begins to crumble, in which there is no longer perception or knowledge, secret or divination." James and the other Anglo-Americans differ from authors because "they have killed interpretation"[417] and are able to write as a process of experimentation.

---

[413] Deleuze, *Essays Critical and Clinical*, 138-151.
[414] Deleuze, *Dialogues II,* 33.
[415] Ibid., 18.
[416] Deleuze, *Essays Critical and Clinical*, 2.
[417] Deleuze, *Dialogues II,* 36.

Much confusion has surrounded Deleuze's possible motives for enlisting so many literary figures in his writing, when he has stated clearly that he is doing "philosophy, nothing but philosophy." To ask such a question (*What did Deleuze really mean by this?*) is contrary to his philosophical project; the very question would send us back into the image of thought of the book-as-text, when his book is not a text, but *writing*. As Michel Pierssens reminds us, "Literature doesn't exist for Deleuze as literarity." Writing is neither an abstract universal, nor a general procedure, nor a model of inscription. "What counts, rather," Piersson continues, is the book "as locus of a precise and crazy operation, a machination."[418] In other words, the book-as-writing is a "precise" site, a situational present that is non-generalizable. Writing is both local and singular. As local, there is no available option to scale it up. As singular, the situation of the book is not interpretational, but experimental. Always involved in the philosophical operations of selection, the book-as-writing is situational and as such, any actual thing is always contingent (a particular event), rather than universalized. The book is, therefore, irreducible; it involves "non-exchangeable, non-substitutable singularities."[419]

For Deleuze, the book is also "crazy," but not merely linguistically so; this is not an experiment in language.[420] "Crazy talk is not enough," they insist.[421] Rather, the book is deemed "crazy" in the sense that it is non-normative and thus we must insist that it is also non-literary: writing is a site for a different set of operations, that is, for the philosophical machinations of "the open book." The openness of the book cannot of course, refer to the vicious interpretive circle of the literary text; rather, "to write" is concrete, situational, experimental, and open to each local discernment. In other words, we don't know what writing will become until we experiment with what's around—*in writing.*

The time of the book-as-text and the book-as-writing are also distinguished. The text is a finished work, and as such, it awaits its own re-enlivening by a subject-reader who operates on its codes. The text is always open to new interpretations, but its written-ness has always already occurred: past tense. For the text, time remains linear; a series of moments in succession. The book-as-writing, on the other hand, is purely open: "In them everything is departure, becoming, passage, leap, daemon, relationship with the outside."[422] The book-as-writing constructs itself always from a *milieu*, without a beginning or end. Always breaking off and starting up again, the book-as-writing is always in the process of becoming-written. Its time, then, is the indeterminate time of the infinitive, "to write." Writing is even "untimely," that is, oriented toward the unknown and always "becoming-other," folded in with time, rather than existing in time.[423]

This is why it makes sense for Stivale to point out that *A Thousand Plateaus* is written as a rhizome because its first lines open up from the *milieu*. Deleuze and Guattari begin:

> The two of us wrote *Anti-Oedipus* together. Since each of us was several, there was already quite a crowd. Here we have made use of everything came within range, what was closes as well as farthest away. We have assigned clever pseudonyms to prevent

[418] Quoted in Stivale, *The Two-Fold Thought*, 265.
[419] Deleuze, "Introduction," *Difference and Repetition.*
[420] Deleuze often uses the term "stuttering," which has led to the common practice of mistaking him for a "poststructuralist." See, "He Stuttered" in *Essays Critical and Clinical*: "It is no longer the character who stutters in speech, but the writer who becomes a stutterer in language."
[421] Deleuze and Guattari, *A Thousand Plateaus*, 138.
[422] Deleuze, *Dialogues II*, "On the Superiority of Anglo-American Literature," 37.
[423] Also see Elizabeth A. Grosz, *The Nick of Time: Politics, Evolution, and the Untimely* (Durham: Duke University Press, 2004).

> recognition. Why have we kept our own names? Out of habit, purely out of habit… Each will know his own. We have been aided, inspired, multiplied.[424]

"The middle," however, is not an average, nor does the "between" designate a localizable space between two distinct entities, as Stivale would have it, for example, as "between" two books (*Anti-Oedipus* and *A Thousand Plateaus)* or between two interlocutors (Deleuze and Guattari or Deleuze and Parnet). Rather, the middle designates an "*intermezzo*" whereby, as Deleuze argues in *Difference and Repetition* following Gilbert Simondon, any "thing" "presupposes a prior metastable state," and emerges from a process Simondon calls "individuation." Thus Deleuze argues that "[i]ndividuation is the act by which *intensity determines differential relations to become actualized.*"[425] It is not that there are two given entities that *then* relate; rather, all entities emerge together "*intermezzo*" from a prior state of indetermination, the effect or event of their processes of interrelation. We can distinguish writing as *intermezzo* from the book-as-text, for it involves the open book, that is, a mode of the book that engages its outsides. Rather than corresponding to its outsides, writing emerges along with its outsides: "Writing always combines with something else, which is its own becoming…This is not a matter of imitation but of conjunction."[426] The book neither refers to nor produces its outside; rather, the book is emergent *along with* its outsides.

One might say that by beginning and ending with a "preoccupation with the book," Deleuze and Guattari have created a framing device—a sort of bookending of the book—through which to read "Rhizomes" and thus we might sufficiently convince ourselves that the essay *really is about* "the book." However, we should not forget that Deleuze and Guattari's endings and beginnings are *between*:

> "*Between*" is a "transversal movement that sweeps one *and* the other away, a stream without beginning or end that undermines its banks and picks up speed *in the middle.*"[427]

Before we make too much of beginnings and endings, that is, before we settle on an interpretation of what it means, we would do well to remember that Deleuze points out:

> It is never the beginning or the end which are interesting; the beginning and end are points. What is interesting is the middle…Bottlenecks are always in the middle. Being the middle of a line is the most uncomfortable position. One begins again through the middle.[428]

The end of "Rhizome, Introduction," then, should not send us on a circular path, or what would amount to a tracing or an expression of signs by two authors that ends with an interpretation. Rather than simply sending us into the vicious circle of interpretation, round and round again, Deleuze and Guattari's experimental writing on the book re-turns us (turns us toward) the intensive condition of the emergence of not only *this* book, but also of an entirely new book, the becoming of the book-as-writing. Our orientation toward "the book" has been transformed. The

---

[424] Deleuze and Guattari, *A Thousand Plateaus*, 3.
[425] Deleuze, *Difference and Repetition*, 246.
[426] Deleuze, *Dialogues II,* 33.
[427] Deleuze and Guattari, *A Thousand Plateaus*, 25.
[428] Deleuze, *Dialogues II*, 29.

writing of this book intensifies itself to bring on the emergence of a new kind of book, the rhizome book, which is one actualized future from what was the literary book. In offering us their last word, "between"—and it is *literally* the last word of the introduction—*between* points to writing as the intensive condition for the emergence of *this* book. By proposing that "writing" is the book's coming into being out of its relations with the world, it is also the appreciation that other books could have emerged, but didn't, as well as those books that still might emerge one day. As this type of experimental return, both the book and writing are *opened up* to alternate pasts and futures.

That Deleuze and Guattari controversially claim in the "Rhizome" that "[t]here is no ideology and never has been"[429] is not to claim that no images of thought deserve to be torn down because they are oppressive (there are plenty); rather, it is to make the much more affirmative claim that critique never comes without construction. We are now in a position to see more precisely the true nature of this construction: we realize that it is much more complicated than simply *writing a book*.

"To write" the book implies an entirely new set of tools and operations than what we are used to. To write the book is not really a method, but a *style*[430] of participating in the transformations of differentiation, or as Deleuze and Guattari call them, actualizations of the virtual. They refers to these styles differently throughout their writings: rhizomatics, pragmatics, diagrammatics.[431] I have already shown that to write the book is a process of limning out obscurities and bringing them into a field of vision. To conceive of writing as operating on the virtual[432] and thus as integral to actualization intervenes on our hegemonic notion of the book-as-text. The text is fundamentally *unreal*: as a process of interpretation, it is circular; as representational, its writing corresponds to the world is representational and therefore exists separately from the real. The text needs to be made real after the fact of its being written. Deleuze and Guattari note that, "philosophers have not been sufficiently concerned with the nature of the concept as philosophical reality." They therefore offer a *pragmatics of writing,* where writing is involved in the *hic et nunc* of situations, experimenting with the *milieu,* or with what's around at present. This writing analyzes "the conditions of creation as factors of always singular movements."[433]

This new age of the book implies that writing matters; its movements are not only real, but also *material.* This final conception of writing that I will discuss here is what Deleuze calls, "diagrammatic." From the Greek, *diagramma* means "to mark out by drawing lines" (*dia* means through, across, apart; *graphein* means to write). Diagrammatic writing, he says, "operates by *matter*, not by substance; by *function*, not by form."[434] Deleuze takes the concept of the diagram from Pierce, who had noted the experimental nature of diagrams in mathematical thought.[435] Diverging from Pierce, however, Deleuze defined diagrammatic writing as functioning "not to

---

[429] Deleuze and Guattari, *A Thousand Plateaus*, 4.
[430] Deleuze and Guattari, *What is Philosophy?,* 8.
[431] "RHIZOMATICS=SHIZOANALYSIS=STRATOANALYSIS=PRAGMATICS=MICROPOLITICS," Deleuze and Guattari, *A Thousand Plateaus*, 22.
[432] "The virtual cannot be grasped, only operated on." James Williams, *Gilles Deleuze's Difference and Repetition: A Critical Introduction and Guide* (Edinburgh: Edinburgh University Press, 2013): 109.
[433] Deleuze and Guattari, *What is Philosophy?,* 11-12.
[434] Deleuze and Guattari, *A Thousand Plateaus*, 141.
[435] Gilles Deleuze, *Francis Bacon*: *The Logic of Sensation*, Translated by Daniel W. Smith (London: Continuum, 2003), 70. See also Jakub Zbedik, *Deleuze and the Diagram: Aesthetic Threads in Visual Organization* (London: Bloomsbury Academic, 2014).

represent, even something real, but rather constructs a real that is yet to come, a new type of reality."[436] Writing becomes diagrammatic, they argue, precisely when an immanent relation to the Outside is produced. When this occurs, "[w]riting now functions on the same level as the real, and the real materially writes."[437] To write, is to engage rhizomatics, pragmatics, and diagrammatics; it is thus a real and material experimental mapping with a genetic role.

This experimental mapping is also taken up by Deleuze with respect to the lines in painting. He characterizes the diagram of a painting in this way: "such is the suddenly outstretched diagram. It is as if, in the midst of the figurative and probabilistic givens, a *catastrophe* overcame the canvas."[438] The catastrophe of the painting, Deleuze says, is its "turning point." There is a moment when it becomes destratified and opens up to a new function. As I have shown, the book, too, has been given its own departure point, its catastrophe: our orientation toward the book has departed, turned from the text to writing. Previously, the book was excluded, cut out from our understanding of rhizomatics because we understood and deployed it primarily as a general analytic. Now, however, having reclaimed writing for rhizomatics, we are now in a position to see how integral writing is to rhizomatics. In terms of this departure point of the book, I would like to pursue here in more detail the notion of the *catastrophe*.

Deleuze remarks on the turning point of a painting or book, but this turn, characterized as a catastrophe designates a specific directionality in Greek (καταστρεφω): it is a *down* turning. But it would be misguided to jump to conclusions about this down-turning by searching for sudden disasters or final ends. In ancient Greek, "catastrophe" connotes neither disaster nor death, but rather a strong sense of subjugation or reduction. Homer's warriors were "trampled" (καταστρεφω), but so were treaties trampled upon; Xenophon's farmers "turned" the soil; Aeschylus' characters experience an "unexpected turn of events;" Herodotus describes Xerxes' attempt "to march throughout Europe and reduce (καταστρεφω) the whole earth under one empire." Death and disaster may or may not be involved in the downward movement of the catastrophe—certainly there are risks in any downturn, and Plutarch capitalizes on this risk when he describes Alcibiades "brought down (καταστρεφω) by the assassins' darts and arrows."[439] To characterize the turning point of the book as a subjugation or reduction—one that admittedly always implies risk—is a strange one indeed, for as soon as Deleuze's diagrammatic writing opens up the book, so it also takes a downward turn. In short, writing's downturn is a determining force that induces actualization.

## Conclusion

By way of conclusion, I would like to bring together the lines that we have been drawing between rhizomatics and diffraction. There is a line from this chapter that seeks to reclaim the book for rhizomatics. To claim that the book-as-writing is integral to the process of actualization gives the book a new force, a new agency that lies entirely outside the limits of signification the dogmatic image of the book-as-text. It is not in the correspondence between language and reality that agency lies; rather, between the lines drawn that open the book up to its own emergence. There is another line in this chapter that attends to the omission of weird quantum logics in

[436]Deleuze and Guattari, *A Thousand Plateaus*, 141.
[437] Ibid.
[438] Deleuze, *Francis Bacon,* 70-77, emphasis in the original.
[439] See Homer's *Iliad*, 3.130; 3.271; 3.354; 4.70-80; 4.308-10; Xenophon's *Economics*, XVII.10; Herodotus's *Histories,* VII. 5-8; Aeschylus's *Agamemnon* [670]; Plutarch's *Alcibiades* 39.3-5.

current new materialist conceptions of the diffractive method. Our goal at present is to bring the weird quantum world *in line* with the diffractive method, so it is here that we return to the operations of quantum diffraction.

In quantum physics experiments, as I have shown, it is the measuring apparatus that induces a particle to drop from indeterminacy to a determined state. Physicists understand quantum measurements as producing the drop from wave to particle. They don't agree about why this happens, but in repeated experiments, measuring *always* induces a transformation from indeterminacy to determined state. This "mysterious" situation of the measurement problem in quantum physics, we might say, is structurally similar to Deleuze's turning point in writing. I am suggesting that these two movements of falling—Deleuze's catastrophe of the book and the collapse of the particle—amplify one another. In both cases, there is a downward directional implication, as well as the production of a determined state from an indeterminate one. As we know, the collapse of the particle is directly related to the measurement apparatus, though not directly causal. Therefore, I suggest that when the book is opened up and the catastrophe determines an actualization, then we have a direct indication that a certain kind of "measurement" has taken place. We can now imagine a movement whereby writing operates like a measurement that induces a drop into determination.[440]

This is not to say that Deleuze based his theory on quantum physics, nor that philosophical and scientific experimentation can somehow be understood as "the same." But as it turns out, Deleuze and Guattari do speak of writing in terms of measurement: "What is essential," and "[a]ll we talk about," they insist, is "in each case, the units of measure."[441] The book requires us, in fact, to "*quantify writing*." The call to quantify writing is disconcerting, since the dogmatic procedures of the book-as-text could never conform to such an imperative. What does it mean to "quantify" writing? It is a proposition that seems nonsensical to our literary ears. And yet we know at least this much: that the quantification of writing cannot refer to size or number.

In their treatment of Kafka, whose writing they deem "minor literature" as opposed to "major," Deleuze and Guattari explain that "the minor" does refers neither to number nor size, to power nor normativity. The terms "minor" and "major" should not be differentiated by number (as in minority/majority) or by size (e.g., the "minority" is the smaller number in a group) or by political position with respect to social normativity (e.g., "marginalized" as the subversive aspect of the dominant norm). They are not differentiated by amounts of power (as in dominant/subversive). They are especially not differentiated by an individual person or genre

---

[440] Please bear with me on this. Yes, I am saying that the book and the particle are analogous in this way. Given my critique of diffractive methods that engage with it as a "mere" metaphor, it seems that I should not so willingly characterize this relation as analogous. After all, Barad says, "arguing from analogy can easily lead one astray." Barad, *Meeting the Universe*, 23. Edmond prefers diffraction as a metaphor for literary studies precisely, he argues, because it makes us aware of the fact that we are using a "mere metaphor" in the first place. I take issue with the common characterization of metaphors as "mere," as if they were simple linguistic components easily understood, an ontological given. In the next chapter, I will suggest that analogies, metaphors, or other rhetorical strategies are a problem for critical studies because they are bound up with representationalism. I will show how these rhetorical and textual strategies are part of the "technologies of telling" that are integral to the materiality of the diffractive apparatus. See Plotnitsky, *Complementarity*, 4-5: "At stake is not so much the analogies themselves…, but first, the process itself of metaphoricity in theory formation that such analogies illustrate, and second, the radical anti-epistemological efficacity…of both the commonalities and differences—or complementarities—of the fields involved." Any use of rhetorical devices here should be held to this ontological difference.

[441] Deleuze and Guattari, *A Thousand Plateaus*, 4.

(e.g., the "marginalized author" or "marginalized literature" as underrepresented). Minor and major are not distinguished by numbers or *quantities* of any kind.[442]

I want to suggest that we have produced sufficient resonances between Deleuze and Guattari's imperative to "quantify writing" and the weirdness of the quantum realm to put them to use for our new image of thought of the book. Quantum weirdness refers first, to the lack of analogic relations between classical and quantum physics. Quantum physics is difficult to describe, not only because there are, strictly speaking, no quantum "objects." Quantum objects do not behave simply as smaller classical ones; rather, the logics of quantum and classical physics are "impossibly different." As we have seen, the book-as-text and the book-as-writing are also impossibly different. To describe the new operations of writing requires a whole new vocabulary. But as Niels Bohr argued, it is not simply a "terminological adjustment" that is needed to characterize weirdness, since second, quantum weirdness also implies that the quantum operates by means of completely different logics. Therefore, our pursuit of a quantum method of diffraction requires both logical and terminological adjustments. In similar fashion, Deleuze and Guattari insist on more than simply new terminology. "Crazy talk is not enough," they insist; rather, what is required is a departure point for the open book. Finally, I have argued that new materialist deployments of the method of diffraction have failed to theorize any specifically quantum elements; their employment of atomistic logic has privileged the "infinitely small" over a theory of quantum superposition. I suggested further that these diffractive entities are "dangerously small;" in other words, when new material feminists maintain merely small entities, they miss out on the potentials of a diffractive method that engages the weird logics of the quantum realm.

Having brought quantum weirdness to bear upon the book-as-writing, we are able to see its agency as a force of actualization. Following that transformation, we can fold our newly established agency of the book back into diffraction in order to "quantize" it as a method. Any quantum method of diffraction, I argued, must account for the fact of decoherence, that is, for the exclusionary moment whereby a given measurement apparatus induces a wave to collapse into a particle. Entanglement is necessary but not sufficient to the theory and practice of specifically quantum diffraction. In addition, new material feminists have insisted upon the necessity of deconstructing the binary between language and reality. Hekman insisted that "something is wrong here," and feminism needs "a new way to understand the relationship between language and reality."[443]

Central to the new material feminist project, then, is the impetus to "bring the material back in" to feminist theory and practice and to deconstruct the binary between language and reality. I argued that as long as they continue to follow atomistic logical and terminological structures, any new relation between language and reality will remain out of reach. I have also insisted that in the scaling up of diffraction, the quantum aspects of weirdness are lost; since the quantum realm does not operate by means of the same logic on a smaller scale; rather, the quantum operations require new terminologies for their "weird" logics. So too, once writing is reclaimed for rhizomatics, we see that the scaling up project had the effect of creating particular exclusionary cuts which prevented the actualization of a new image of thought of the book.

Now armed with a new orientation toward the book-as-writing, new material feminists can engage with the book as a part of the situated diffractive measuring apparatus. In other words, we are able to utilize writing as an agential measurement which both produces its own

[442] Deleuze and Guattari, *Kafka*, 36; *A Thousand Plateaus*, 8-9.
[443] Hekman, *Material Feminisms*, 92.

emergence, and also accounts for the exclusionary cuts in phenomena that allowed for the actualization.

Of course, Hekman has warned us of the hegemonic nature of linguistic constructivism in the critical humanities, and surely this has contributed to our inability to understand the book-as-text as anything but unreal. Because of this hegemonic hold over our thinking, it will be difficult to sustain an engagement with our new orientation toward the book. In order to help this transition along, in the next chapter I will not lay down the components of this new image of thought of the book. Images of thought, as Deleuze argues, are not grounds of or relations to truth, but rather "make us aware of new variations and unknown resonances, it carries out unforeseen cuttings-out." The book as "decoherent writing," then, cannot run the risk of reintroducing subjectification, signification and organicity. If the concept of decoherent writing is going to be useful to new material feminism, it can only do so as "imageless," in other words, as singular and local diffractive experimentation. Decoherent writing, then, is literally experimental.

I would like, however, to immediately rule out any confusion in our understanding of experimental writing of decoherence and the tradition of experimental literature. Any reconfiguration of the book as experimental is especially vulnerable to this conflation since Deleuze often refers to modern "experimental" authors such as Burroughs, Kafka, and Joyce. However, keeping in mind that Deleuze treats these writers not as "authors but creators," we can avoid such confusion. Experimental literature is incredibly varied and spans the centuries, for example, from the surreal to the postmodern, and from found poetry (non-poetic) to code poetry. However, the one thing all these forms of experimental writing have in common is that they raise fundamental questions about the nature of the literary art: "What is literature, and what could it be?" "What are the functions, limitations, and possibilities of literature?"[444] Our new orientation toward the book as decoherent writing and thus a site of experimentation is not at all concerned with these literary questions. Quite the opposite; while the experimental text experiments on itself, it remains in its essence *the same*; the experimental book, however, is neither literary nor the same as itself; on the contrary, it is a purely open book, always drawing upon its outsides to construct "the singularity of a material flow."[445]

By way of final conclusion, I want to insist that the reconfiguration of the book as decoherent writing restores for us the missing quantum element that is essential for a new materialist quantum method of diffraction. In reclaiming writing for new material feminism, we can utilize its weird machinations that are both material and real. In the end, it is writing, ironically, that finally "brings the material back in" to feminist theory and practice. In the next chapter, I will explore the ways in which this reconfiguration of the book as decoherent writing operates in the quantum method of diffraction.

[444] Joe Bray, Alison Gibbons, and Brian McHale, *The Routledge Companion to Experimental Literature* (London: Routledge, 2012).

[445] Joshua Alan Ramey, *The Hermetic Deleuze: Philosophy and Spiritual Ordeal* (Durham: Duke University Press, 2012). On the confusion between anexact and inexact, see Ronald Bogue, *Deleuze's Way: Essays in Transverse Ethics and Aesthetics* (Burlington: Ashgate, 2007).

# Chapter Four
# Visualizing Criticality: Representing the Diffractive Method

*The one problem which recurs throughout Plato's philosophy is the problem of measuring rivals and selecting claimants. This problem… is a question of making the difference, thus of operating at the depths of the immediate… It is a dangerous trial without thread and without net, for according to ancient custom of myth and epic, false claimants must die.*

~Gilles Deleuze

## Introduction

In "From Within the Midst of Things," Samantha Coole explains that the new materialist movement involves a reorientation toward the material that moves away from abstraction and formalism, away from structural analysis and classificatory methods, and toward empiricism, but not positivism. New materialism is a new ontology, she says, which opposes both the utilitarian tendency of Heidegger in which things are dead and merely "ready-to-hand" as well as the Cartesian splits between subject/object and mind/body. It views matter as "lively and constitutive," and as having "its own forces of resilience, resistance and productivity." Coole argues that there are two offshoots of this new materialism. On the one hand, following Nietzsche, new materialism embraces the theme of the generative and vital capacities of matter, and offers an invitation "to practice an affirmative ethos in which creativity, innovation, and the event inspire a more open and respectful attitude toward nature/things."[446] On the other hand, new materialism follows a "more mundane" path, one which demands "a robust understanding and critique of existing systems" and "focuses on the way in which matter is actually being transformed to alter everyday experiences and life chances."[447] Karen Barad seems to reinforce Coole's split by fervently distinguishing the diffractive method from critique, and calling it specifically "affirmative."[448]

In an interview, Barad quite flatly states, "I am not interested in critique. In my opinion, critique is over-rated, over-emphasized, and over-utilized, to the detriment of feminism." Critique has become a destructive habit, Barad says, a practice that is "meant to dismiss, to turn aside, to put someone or something down—another scholar, another feminist, a discipline, an approach, et cetera." Nowadays, critique is a "practice of negativity," she insists, a mode that is all "about distancing and othering." Following Bruno Latour, Barad also insists that "critique has run out of steam," and if we are going "to dismantle [the] critical weaponry so uncritically built up,"[449] we must develop "other kinds of engagements to practice." Barad adds:

---

[446] Samantha Coole, "From Within the Midst of Things," *Realism Materialism Art: Edited by Christoph Cox, Jenny Jaskey, and Suhail Malik* (Berlin: Sternberg, 2014), 41-46. Coole cites Jane Bennett, *Vibrant Matter*, as exemplary of the "vitalist" side of materialism.

[447] *Ibid.,* 45. Coole cites herself (2013) as representing this tendency.

[448] Barad, "Cutting Together-Apart," 187 fn 11: "Whereas critique operates as a mode of disclosure, exposure and demystification, diffractive reading might be understood as a form of affirmative engagement...Diffractive methodology seeks to work constructively and deconstructively (not destructively) in making new patterns of understanding-becoming."

[449] Latour, *Has Critique Run Out of Steam?*

> critique is a tool that keeps getting used out of habit perhaps, but it is no longer the tool needed for the kinds of situations we now face…. Instead, what I propose is a practice of diffraction, of reading diffractively for patterns of difference that make a difference.[450]

Barad says that diffraction is "an apt metaphor" for her methodological approach, but in her version of diffraction "at the next level up," it is also more than a metaphor. As I have shown, she combines the scientific understanding of diffraction as a physical phenomenon with the feminist understanding of diffraction as an analytic tool. As a physical phenomenon, diffraction refers to wave behavior and its interference patterns; diffraction is one of the "fundamental constituents … of the world."[451] As a feminist methodology developed by Trinh Minh-ha and Donna Haraway, diffraction offers an alternative to reflection; it's a figuration for a new optics, "a metaphor for the effort to make a difference in the world."[452] Unlike the habit of reflection, Haraway maintains that the diffractive methodology "refuses to invite the illusion of a fixed subject position" and entails "attending to patterns of difference" because these difference patterns and their effects, she continues, have the power to train us to see "with a more subtle vision."[453]

It is the question of vision, I want to suggest, that is central to the method of diffraction. What optics are produced by new material feminist practices and through what means do they emerge? As I argued in Chapter 1, most diffractive readings by new material feminists draw on Barad and Haraway's methods, but remain tethered to the assumptions of representationalism. Barad argues that "representationalism is so deeply entrenched within Western culture that it has taken on a common-sense appeal. It seems inescapable, if not downright natural." Representationalism operates like "any good magician," Barad insists, because it "hides the very practices that produce the illusion of givenness.[454] In other words, representations are what "conceal their very mode of production."[455] Barad wants to dispel the illusions created by representationalism. She claims that representationalism "marks a failure to take account of the practices through which representations are produced. Images are not snapshots…but rather, condensations of traces of multiple practices of engagement."[456] In the creation of representations, constitutive materials are excluded in order for them to exist. Barad's method of diffraction thus entails "a practice of reading for the constitutive exclusions of those ideas we cannot do without." But diffractive readings don't read for exclusions, and tend instead to be caught up in traditional modes of reading, including the cycle of interpretation (see Chapter 3), "close" reading, and locating "resonances," or intertextuality (see Chapter 3), which all maintain the separation of language and reality (see Chapter 1). Barad's study of visualizing practices helps to clarify how diffraction at the next level up is different from these many applications of the diffractive method, and also to distinguish what is both "higher" and "affirmative" in this form of diffraction as opposed to others.

---

[450] Barad, "Intra-actions," Interview by Adam Kleinmann, *Mousse Magazine* (Summer 2012), 76-81.
[451] Barad, *Meeting the Universe*, 72.
[452] Haraway, "The Promises of Monsters."
[453] Barad quoting Haraway, *Meeting the Universe*, 29.
[454] Ibid., 360.
[455] Ibid., 48.
[456] Ibid., 52.

## Representational versus Performative Diffraction

Barad's most illustrative example of representations in diffraction comes from her study of the scanning tunneling microscope (STM). The STM is an electron microscope that allows scientists to "see" three-dimensional images of atomic surfaces. The STM is particularly interesting, Barad says, because it works differently than optical microscopes. Because it uses very different principles than sight, it "undermines any illusion that the image represents a mere magnification of what we see with our eyes."[457] In other words, the example shows not only how complicated representational practices can be, but also shows how "proof" for the existence of atoms is not simply "found," (as in, "seeing is believing"), but produced by means of layered sets of practices that necessarily involve more than just sight.

Don Eigler, physicist at the IBM Almaden Research Center, describes the operations of the STM as more like "feeling" than seeing. The way it forms an image "is similar to the way a blind person can form a mental image of an object by feeling the object."[458] Rather than physically touching the objects, the STM uses a "tunneling current" that flows between the atomic surface and a hyper-fine stylus probe. The arrangement of atoms correlates with the flow of current; this flow is measured; the data gathered from the measurements is visualized, and mapped onto an image on a computer screen. "Seeing" images through the STM thus "operates on very different physical principles than sight," Barad argues. Images of atoms are not created by simply "pushing a button" and capturing the image of an object too small for the naked eye to see. On the contrary, the images produced by the STM require multiple and varied practices. For example,

> [t]he specimen has to be prepared and carefully positioned on the scan head; a new tip has to be cut for each specimen; the tip has to be carefully positioned above the surface of the specimen; the specimen's tilt coordinates have to be adjusted properly; the system has to be isolated from direct light, vibrations, air currents, and temperature fluctuations during the scan, or else the image will be compromised; a scan range must be selected; and the operator must decide if the image produced constitutes a "good image."[459]

Achieving these images through multiple practices, notes Barad, also "takes a good deal of practice."[460] What Barad reveals is that there are things that need to be excluded, cut out, in order for other things to stand out. In this instance, she shows the "exclusionary practices that matter" to produce the STM images, indeed she draws attention to the bracketed techniques that are required to produce the *illusion* that we are "seeing" a simple magnified image of atoms.

Barad shines a light on the representational practices of scientific experimentation in order to account for the exclusions that actively produce scientific intelligibility. Images are not snapshots, she tells us. As an analytic tool, diffraction is not "merely critical," that is, it cannot stand back to examine, analyze, comment on or describe existing states; these tools are also "fundamental constituents of the world." Diffraction therefore challenges the ontology that underlies representationalism and

---

[457] Barad, *Meeting the Universe*, 51.
[458] Don Eigler, "From the Bottom Up: Building Things with Atoms," *Nanotechnology*. Edited by Gregory L. Timp (New York: AIP/Springer, 1999), 425-36.
[459] Barad, *Meeting the Universe*, 52.
[460] Ibid.

> the assumption that there are representations, on the one hand, and ontologically separate entities awaiting representation, on the other, and focus[es] inquiry on the practices or performances of representing, as well as the productive effects of those practices, and the conditions for their efficacy.[461]

Diffraction "at the next level up" entails overcoming the ontological presuppositions in representationalism that provide for "distance" between things and images of things. What is involved in "seeing" is the view from afar, but it is far from simple. Seeing requires a vastly orchestrated production, or *performance,* that constitutes intelligibility. This means that the knowledge gained from those images is also not a "mediated" activity:

> Knowing is a direct material engagement, a practice of intra-acting with the world as part of the world in its dynamic material configuring, its ongoing articulation. The entangled practices of knowing and being are material practices.[462]

Barad argues that diffraction is precisely the type of new analytic tool feminism requires because while exclusions are inevitable and constitutive, diffraction goes beyond offering a theory of exclusionary power; diffraction at the next level accounts for precisely how representational exclusions get made. Thus, to the extent that Barad develops a form of "critique" it is very different from the more traditional modes of critique that she denounces. This is because critique cannot inhabit a position from which to stand back and evaluate without "interference." Barad quotes Ian Hacking, "Don't just peer; interfere."[463] This mode of diffraction opposes a notion of critique that would assume such an imaginary position, one whereby critique embodies the role of transcendent watchdog. Any diffractive form of critique must necessarily involve itself in the production of that which it purportedly "sees." Ontologically, diffraction involves a method in which the "agencies of observation" intra-act in a direct, material engagement with the "objects of observation," rather than inter-act across an ontological gap that separates the two.[464]

Crucial to Barad's revised intra-active notion of critique is "performativity." While she begins with the diffractive metaphor as it was developed by feminists Trinh and Haraway, Barad draws on Judith Butler's concept of performativity. As a performative analysis, diffraction necessarily "involves reading insights through one another in ways that help illuminate differences as they emerge: how different differences get made, what gets excluded, and how those exclusions matter."[465] Barad insists that Butler's concept provides an "insightful and powerful analysis of some discursive dimensions of the materialization of real flesh-and-blood bodies."[466] She concedes that Butler "leaves out critical components" in her analysis, but also notes that this is not a criticism; on the contrary, Barad refers to Butler's treatment of the nature of exclusions as necessary and productive. She refuses to reject Butler's theory of the materialization of matter; instead she offers a "productive appropriation" of her theory.[467]

---

[461] Barad, *Meeting the Universe*, 49.
[462] Ibid., 379.
[463] Ibid., 50.
[464] Ibid., 31.
[465] Ibid., 30.
[466] Ibid., 192.
[467] Ibid: "That Butler's analysis enacts its own exclusions is not in and of itself a fatal flaw. On the contrary, according to Butler's own treatment of the nature of exclusions, they are not only necessary but productive, particularly in their instability and consequent availability for rearticulation."

In contrast to representationalism, which presumes an ontological gap between things and their representations, performativity entails a theory and practice in which humans and their measuring tools "intra-act" in direct engagements to produce complex visualizations. These visualizations are what allow scientists to "see" facts, artifacts, bodies, experimental data and results. Furthermore, what we call *visual*izations are not limited to the visual realm; Barad's analysis of the STM highlights in particular *the non-seeing aspects of seeing*. Indeed, there is a whole realm of material practices that are excluded from the visualizations that are nevertheless productive for the visualization.

I want to use this notion of the non-seeing aspects of diffraction as an anchor for this fourth chapter. In what follows, I look to the particular capacities of seeing and knowing generated by new material feminist discourse. Haraway calls diffraction "a figuration for a more subtle vision," and I pay special attention to the kind of "optics" that are produced in new material feminism as a discourse, and how these optics are bound up multiple interdisciplinary technologies not unlike the ones that produce images through the scanning tunneling microscope. Unpacking the condensed traces of representational practices in new material feminism, I will attend to the non-seeing aspects of visualizing practices, and shed light on the exclusionary and constitutive practices that matter for new material feminism.

This chapter also signals a shift in register. In previous chapters, I demonstrated the ways in which new material feminism tends to employ the diffractive method. I noted that these "readings for the differences that matter" tend to use metaphors from the laws of classical diffraction, rather than quantum diffraction. In particular, I argued that these diffractive readings tend to privilege entanglement and connection over decoherence, despite the fact that the "drop" in decoherence is the very productive mechanism by which indeterminacy falls into a determined state. In terms of Barad's agential realism, it is the very operation by which a "cutting" into the real produces an "object" from phenomena. Previously, I referred to these classically driven diffractive readings as a "glaring oversight," that is, a failure by new material feminists to "see" the difference between quantum and classical notions of interference, which led them to treat the diffractive method as a lens for reading (i.e., "seeing) "difference," and therefore to neglect the potential in quantum superposition and decoherence for the method. In other words, I provided a critical reading of texts by new material feminists. My reading found fault with theirs, and questioned the language of the text "as to its truth or falsehood, its transparency or opacity."[468] It assumed that my ability to "see" the quantum elements of diffraction that the other missed. The critique presented in this chapter aims instead at what Foucault calls *genealogy*: "something that attempts to restore the conditions for the appearance of a singularity born out of multiple determining elements of which it is not the product, but rather the effect."[469] The first reading (Chapter 1) conforms to traditional critique; the second reading (Chapter 2) positions diffraction as a genealogical practice; this reading (Chapter 4) accounts for the first and moves into the mode of the second.

At this point, I would like to characterize the argument a bit differently. Instead of viewing the new material feminist readings as an oversight, a case of "not seeing" something that is already there (quantum interference and superposition), I would like to suggest that each diffractive reading produces its own particularly constitutive visualizations by means of certain operations of exclusion. These operations include both seeing and non-seeing elements, as Barad

[468] Michel Foucault, "What is Critique?" *The Politics of Truth,* Edited by Sylvère Lotringer, Translated by Lysa Hochroth (Los Angeles: Semiotext, 2007), 164.
[469] Ibid.

points out, and together they include and exclude certain possibilities. New material feminists employ the diffractive metaphor explicitly to produce "a more subtle vision." This conforms to the view of metaphors as a lens for shifting feminist thought: a tool for seeing, thinking, and knowing differently. Implicitly, however, the readings produce visualizations by means of techniques that are necessarily bracketed out, but nevertheless produce what counts as intelligibility (what is "seen") for new material feminist discourse. In other words, these diffractive readings constitute exclusions that matter for new material feminism. More specifically, I want to argue that the exclusion of quantum elements from diffractive readings allows for a particular brand of "affirmative critique" to emerge. In other words, it's not simply that, as I argued earlier, many of these diffractive readings tend to be "affirmative" in nature; rather, it is the case that these diffractive readings emerge precisely *as affirmative* only by means of the very exclusions they enact.

In feminist theory, diffraction is used largely as a metaphor, "a new optics," that allows us to "see" difference differently. As Barad shows, images allow us "to see," but these are not magnifications of reality. What we call "seeing" is not a matter of "merely looking—of passively gazing on something as a spectator—but an achievement that requires a complex set of practices to accomplish."[470] The achievement of these practices is to produce the givenness of seeing, and then to erase their own conditions of being produced.[471] These multi-layered practices include linguistic visualizations. In what follows, I propose to trace specific non-seeing practices that operate to visualize the givenness of stories, and which produce intelligibility and knowledge for new material feminist discourse by erasing themselves as produced. Aristotle commented on the pedagogical pleasure of metaphors due to their ability to vivify the world, or what he called "to bring-before-the-eyes."[472] I call these practices "technologies of telling" as way to vivify their performative structure.

## Technologies of Telling

My goal here is to identify the various techniques by which representations are created and transformed by means of linguistic tools, or "technologies of telling," that operate constitutively as exclusions that matter for new material feminism. As material practices, these

[470] Barad, *Meeting the Universe*, 51.

[471] Science studies has produced much work on this; see, Bruno Latour, *On the Modern Cult of the Factish Gods*. Durham: Duke University Press, 2011); Isabelle Stengers, *Cosmopolitics II*, (Minneapolis: University of Minnesota Press, 2011); Daston and Galison, *Objectivity*.

[472] I am inspired by Aristotle to call these linguistic visualizations, "technologies of telling." His commentary on the relationship between rhetoric as a *technē* (but a "mixed" one) and the role of visualization for learning and knowledge will help me to fill out the ways in which language, following Barad and Bohr, can be theorized in non-representational terms, but needs to be fleshed out more at a later time. See Aristotle, *On Rhetoric*. *A Theory of Civic Discourse*, Translated by George A. Kennedy (Oxford: Oxford University Press, 1991). The word "technologies" harkens back to ancient Greek *technē*, and it is often distinguished from *epistemē*, or knowledge. According to Aristotle, rhetoric is a *technē*, a word most often translated as "art," "craft," or "skill" and tends to pertain to all those things that fall under the category of "practice." Although many consider rhetoric a tool (*organon*), most modern scholars of antiquity take Aristotle's definition of rhetoric to be a more productive art, like medicine. Aristotle says that "Metaphor most brings about learning" and that "[U]rbanity ("elegance of speech") is achieved by means of "bringing-before-the-eyes" (visualization). He says "…it is also good to use metaphorical words; but the metaphors must not be far-fetched…The words, too, ought to set the scene before our eyes." Chapter 10.2 and 11.1. Also see Richard Moran's reading of Aristotle on metaphor: "It is no exaggeration to say that the primary virtue of metaphor is for Aristotle the ability to set something vividly before the eyes of the audience." Moran, Richard. "Artifice and Persuasion: The Work of Metaphor in the 'Rhetoric'," *Essays in Aristotle's Rhetoric,* Edited by Amélie O. Rorty (Berkeley: University of California Press, 1996), 385-98.

technologies produce the givenness of language as a separate domain. What are the bracketed technologies of telling, each hidden but required, that work behind the scenes to produce the illusion that "reading for difference patterns" in new material feminist diffractive readings? By what means are we seeing what's *there*? I focus in on the linguistic technologies that contribute to seeing "differences that matter." If "seeing is an achievement,"[473] accomplished through complex practices, what are the specific linguistic visualizing practices, the "technologies of telling"?

In "Telling Feminist Stories," Clare Hemmings explores the rhetorical power of citational practices in feminist writing. She argues that contemporary feminist publishing practices often oversimplify "the story" of feminism. The dominant narrative of Western feminism's recent past is told as a story of generations and progress; this story is secured, Hemmings argues, both "textually and rhetorically."[474] The story of feminism goes like this: the naïve, essentialist 70s (which were focused on unity and sameness) gave way to the black critiques and sex wars of the 80s (which were focused on identity and diversity), which gave way in turn, to an explosion of difference and fragmentation in the 90s. The whole story depends on the establishment of three distinct and fixed decades or "generations" (the 1970s, 80s, and 90s) that move progressively toward difference. This progression is secured, she says, through the production of "an unfavorable comparison with poststructuralist feminist theorists."[475] Hemmings identifies poststructuralism as the key feature that emerges in each return to the past; in each case, special agency is attributed to poststructuralism. Sara Ahmed argues that it's not just the term "poststructuralism" that works to achieve this, but rather a whole host of terms that metonymically acquire significance through their nearness to "poststructuralism." Words such as "postmodernism," "social," "language," "discourse," and "culture" all work to evoke the negatively associated connotations of poststructuralism.[476] A simple negative comparison to poststructuralism, then, is all an author needs to make her project stand out.

This opposition is used often by new materialists. For example, Diana Frost and Samantha Coole note in the introduction to *New Materialisms: Ontology, Agency, Politics* that "the more textual approaches associated with the *cultural turn* are increasingly being deemed inadequate for understanding contemporary society."[477] Elizabeth Wilson (2004) presents a stronger case; condemning poststructuralism as a defiant enemy, she argues that "most feminist research on the body relies on theories of *social construction*" it is "in defiance of biological models…" These feminist theories, she goes on, have been "*reluctant* to engage with biological data; they retain, and encourage, the fierce antibiologism marked by the second wave of feminism."[478] Here poststructuralism is characterized as "defiant" and "fierce," a monstrous enemy that has emerged because "these feminist theories have been *reluctant* to engage with biological data." In Wilson's characterization, no blame is given to individual writers. The opposing sides of the battle are generalized: on the one hand, "theories" and "research," and on the other hand, "biological data." Blame is heaped onto a generation of feminists, rather than any individual texts. It is the second wave feminists, Wilson continues, who "retain and encourage the *fierce* antibiologism marked by the second wave of feminism."[479] Wilson's prose maintains

[473] Barad, *Meeting the Universe*, 156.
[474] Hemmings, *Why Stories Matter*, 115-116.
[475] Ibid.
[476] Sara Ahmed comments on new material feminism in particular, while Hemmings' critique is much broader.
[477] Coole and Frost, *New Materialisms: Ontology, Agency, and Politics* 2-3
[478] Wilson, *Psychosomatic*, 13 (emphasis mine).
[479] Ibid.

the notion of a naive earlier generation, sets up a poststructuralist enemy—maneuvers that operate to secure her own position as having progressed beyond them.

In their introduction to *Hypatia* (2004) "Special Issue on Feminist Science Studies," Lynn Hankinson and Alison Wylie also promote their investigations into the practice of science in opposition to poststructuralism in the form of constructivism:

> despite the greater currency of *constructivist* insights, most [feminists] continue to insist that an unqualified, *reductive social constructivism* is just as inadequate a framework for understanding science as the foundationalism and objectivism against which it is typically counterposed. These convergent insights…do not settle the most challenging questions about how we are to understand the practice and products of science.[480]

Wylie and Hankinson Nelson construct a clear distance between the prevailing, but inadequate, discourse of social constructivism. The difference here is their focus on the numerous real women who oppose it. In this example, the negative comparison points to a generalized approach (constructivism) and a battle ensues: a valiant group of individual women have been unable to dislodge the enemy system.

Similarly, in their introduction to *Material Feminisms*, editors Susan Hekman and Stacy Alaimo characterize poststructuralism, generally as "the linguist turn." Only now this turn is a "disease" that has thrown feminism into a crisis: "feminist theory is at an impasse caused by the contemporary *linguistic* turn in feminist thought." Their volume addresses what they call "the dis-ease in contemporary feminist theory and practice that has resulted from the loss of the material."[481] Once more, the disease is a larger system of thought, while the cure for the disease is attributed to individual feminists. According to Hekman and Alaimo, their volume brings together individual

> thinkers who are attempting to move beyond *discursive construction* and grapple with materiality…The new settlement we are seeking … accomplishes what the *postmoderns* failed to do: a deconstruction of the material/discursive dichotomy that retains both elements without privileging either.[482]

Here too, the enemy is a system of thought, "discursive construction" and the "postmoderns;" these diseased discourses must be eradicated by a few brave individuals, namely, the feminists who write for the volume and help to "bring the material…into the forefront of feminist theory and practice."[483] On the one hand, contemporary feminists often look back negatively, not to individual authors, but rather, to a generalized decade or approach in order to guarantee citational authority. Individual thinkers, feminists, or authors, on the other hand, are characterized militaristically as those who dare to try to dismantle the hegemonic movement. Hekman secures her version of the history of the crisis by making just this split; she says that "feminists in particular" are facing a "theoretical crisis," and she blames the "universal theories that informed

---

[480] Lynn Hankinson Nelson and Alison Wylie, "Introduction: Hypatia Special Issue on Feminist Science Studies," *Hypatia* 19.1 (2004), vii-xii (emphasis mine).
[481] Alaimo and Hekman, *Material Feminisms*, 6.
[482] Ibid.
[483] Ibid., 1.

feminism at the beginning of the second wave." These theories are "ubiquitous," she adds, but "are no longer relevant."[484]

New materialists tend to distinguish their approach through negative connotations associated with poststructuralism and its metonymic linguistic neighbors: social, culture, postmodern, constructed, discursive, language, and so on. The insistent repetition of the contrast between poststructural feminism and new material feminism amounts to an academic shortcut whereby strict dichotomies emerge between two approaches to feminism (material vs. linguistic) and between the individual and the collective (women, writers, feminists vs. generations, systems, frameworks). These dichotomies operate by negation, privileging one term by means of negating the other. This rhetorical maneuver reproduces its own negative other upon which it depends for existence. By means of these rhetorical strategies, masses of feminist work are excluded from claims to legitimacy in contemporary feminism.

While new material feminist rhetorical strategies tend to highlight the positive work done by individual feminists against the negative connotations of a general movement or approach, there is one interesting exception to this rule. In the story of feminism, one individual has emerged as a "poststructuralist villain." She is the one female writer who has gained exemplary status from her association with poststructuralism.[485] In a synecdochic maneuver, Judith Butler is used repeatedly to stand in for all of poststructuralism. The villainizing of Butler should be understood as an example of what Hemmings calls a "common sense gloss," or what she defines as a citational practice whereby a number of contradictory rhetorical maneuvers are achieved by an author at once.

Hemmings explains how this works.[486] First, because the individual, Judith Butler, stands in for the whole system of thought, the author needs only limited citations to secure an entire field of inquiry. A quick citation or two from Butler, who represents all of poststructuralism, sets up the necessary conceptual markers about to be dismantled. Second, the consolidation of the many into the one serves to mark a crucial transition in the timeline of feminism. Initially, Butler's exemplary status is cited to construct her as a "hero" of feminism; she is a "threshold figure" who signals sophistication and the transition from understanding gender identity as fixed to understanding it as fluid. Butler rhetorically "signals the death of one way of thinking and the inception of a more flexible way of thinking." [487] The individual author associates herself with the latter, more flexible mode. However, Butler must carry the additional burden of sophistication gone wrong and she represents also a "failed feminism." When cited by the author, finally Butler is "blamed" for all the poststructural ills of feminism, and she stands in as a marker for and proof of the flawed history that the author in question has "surpassed."[488]

The poststructural villain makes many appearances in the story of new material feminism. In her contribution to *Material Feminisms*, Hekman points to Butler as a marker of change between poststructuralism and new material feminism. For Hekman, Butler signifies the starting point for overcoming linguistic constructivism:

---

[484] Hekman, "Constructing the Ballast: An Ontology for Feminism," *Material Feminisms*, 85.

[485] Clare Hemmings, "Telling Feminist Stories," *Feminist Theory* 6 (2005): 115-139. Hemmings names Donna Haraway and Gayatri Spivak as "threshold figures," that is, individuals who mark increased sophistication in the field. Butler holds the additional burden of someone whose sophistication has turned against feminism.

[486] Ibid.

[487] Hemmings names three feminist heroes, each signifying a marker of change in a different area of study: Butler marks the shift from fixed to fluid gender identity; Donna Haraway marks the shift from the essentialist body to situated positions; Gayatri Spivak marks the shift from biological to postcolonial difference.

[488] Hemmings, "Telling Feminist Stories," 125.

> Feminist discussions of the body are beginning to move beyond the restrictions imposed by linguistic construction. The starting point for many of these discussions is the effort to counter Judith Butler's claim that the body is not prior to discourse, but rather, its effect (1993, 30).[489]

Elsewhere, Hekman argues that although Butler's theory of a fluid, discursive identity replaced the essentialist subject of the modernist discourse, in practice it failed because it never materialized into a new politics. "For a long time," Hekman's story goes, feminists have been saying that Butler's theory of identity "goes too far," but have failed to find a replacement.[490] Hekman thus positions herself as flexible enough to surpass the poststructural disease that Butler represents.

In another example of new material feminist writer who has surpassed Butler and all she stands for, Stacy Alaimo argues that "for centuries," women have had to contend with "the nature that has been waged against" them. Nature, she says, remains a space of potent possibility for women, and yet we have not come to understand how women inhabit nature because "feminist theory distances women from nature."[491] Alaimo takes Butler as emblematic of feminist theory's "flight from nature,"

> If we are all constituted by discourses implicated in oppressive systems, there is never any untainted path to liberation, only, as Judith Butler would have it, the possibility of 'reworking that very matrix of power by which we are constituted.'…Though 'women' are constituted differently along several axes of power—race, class, and sexuality, for example—many of these axes are also inflected by pernicious notions of nature.[492]

Butler is the feminist who represents all theories of the discursive matrix of power whose "flight from nature" has tainted feminism forever, preventing it from ever achieving liberation.

Again, Gillian Howie (2010) outlines three types of materialism—physicalism, empiricism, and historical materialism—in order to set up the dichotomy between them and poststructuralism. "For a number of reasons, not unrelated to the hegemonic influence of postmodernism and post-structuralism on the intellectual landscape, during the last few decades," Howie argues, the materialist question of the possibility for theorizing a synthesis between the subject and the object has completely "fallen apart." According to Howie, her book is an attempt to think differently about this relationship. Howie turns to Butler as the clear frontrunner of the discourse, setting her up as the turning point in feminism. "Judith Butler is right," she says, that "matter is fully sedimented with discourses on sex and sexuality," but then Howie insists that Butler's rejection of objectivity leads feminists to an "awkward position" that degenerates into unhealthy skepticism, finally preventing feminist from ever grasping or changing social oppression.[493] Once again, the sad story of the failure of feminism is pinned on Butler.

---

[489] Hekman, *Material Feminisms*, 106.
[490] Susan Hekman, "Beyond Identity: Feminism, Identity and Identity Politics," *Feminist Theory* 1.3 (2000): 289-308.
[491] Alaimo, *Undomesticated Ground,* 2000, 2.
[492] Ibid., 102.
[493] Gillian Howie, *Between Feminism and Materialism: A Question of Method* (London: Palgrave Macmillan, 2010).

In an interview in *New Materialism: Interviews and Cartographies*, Rosi Braidotti blames Butler for all that is wrong with European feminism. Braidotti theorizes a split between European and American poststructuralism, and Butler emerges as the synecdochic marker of the special American brand and its "hegemonic hold" on European feminist theory. Braidotti initiated the requisite armament against the American villain; as founding director of ATHENA (the Advanced Thematic Network of Women's Studies in Europe) that provides "a friendly but firm criticism of the American hegemony in feminist theory," Braidotti and her group "attempt to develop other perspectives."[494]

In another example, Vicky Kirby notes the feminist polemic surrounding the purportedly "failed materialism" in Butler's work.[495] Kirby gives special attention to Butler's contribution to the "vagaries of interpretation" in *Quantum Anthropologies*. Kirby shows how Butler's argument that scientific objects are also, in a certain sense, "literary," "textual," or "encoded," helps in feminist fights against positivism. However, Butler's description of the relation of interpretation to materiality unfortunately leads to the complete displacement of Nature. Ultimately, Butler leads feminism to the nonsensical assertion that "*humanness is profoundly unnatural*."[496]

As a final example in this refrain, Rick Dolphijn and Iris Van der Tuin cite Butler's reading of Simone de Beauvoir as having become "hegemonic," the only reading feminists depend upon anymore. Butler also overemphasizes the sex/gender split, they argue, and provides an "oversimplified idea of language."[497] Their new material feminist approach, will of course, surpass her rigid, hegemonic framework. As "transversal" and "immanent" rather than dualist, new materialists "scholars from their respective disciplinary locations" "nomadic traversing of the territories of science *and* the humanities."[498] The practices of consolidating decades of poststructuralist work ("feminist" and otherwise) into the person of one particular, academic feminist named Judith Butler, and hailing the work of individual academic writers who fight against big, bad systems is widespread in new materialist discourse.

I want to point out that this replacement of the many in the one is a crucial linguistic operation that performs many operations very quickly for the discourse of new material feminism. Citing Butler's work, new material feminists accomplish a number of "optical" tricks, that is, it allows writers to visualize certain features relating to the story of feminism. Authors do not innocently cite texts from the past; rather they utilize technologies of telling, which harbor multiple and complicated practices. To visualize Judith Butler in these ways depends upon *synecdoche* (substitution of part for whole; Butler represents all of poststructuralism), *anabasis* (an auto-antonym which signals both an advance and a retreat; Butler brought feminist theory to its height or its failure), *false dilemma* (a false either/or choice; Butler is either sophisticated feminist theorist or a poststructuralist villain), *metaphors* ("threshold figure," "hero," "villain"), *the post hoc fallacy* (Butler wrote before the failure of feminism, therefore she caused it), and other rhetorical strategies. These strategies must always be erased, covered over in order for the feminists "to see" these stories, and to visualize the "differences that matter." What are the differences that matter for new material feminism? The difference between past and present, old

---

[494] Dolphijn and Van der Tuin, "Barad Interview." *New Materialism.*

[495] Vicki Kirby, *Judith Butler: Live Theory* (London: Continuum, 2007). Catriona Mortimer-Sandilands, an exception to this rule, notes that "Despite the fact that she is often (incorrectly) held up as an example of the disembodied limits of social constructivism, Judith Butler (e.g., 1993) has made huge inroads into understanding gender and embodiment as simultaneously and complexly material and social."

[496] Vicki Kirby, *Quantum Anthropologies: Life at Large* (Durham and London: Duke University Press, 2011), 75.

[497] Dolphijn and Van der Tuin, *New Materialism*, 143.

[498] Ibid., 100-101.

and new, poststructuralism and new materialism, particular and general (in the form of individual feminists, generations of feminism, or individuals and systems of thought). These visualizations don't allow us to "see" the corresponding reality of feminism, but rather, as technologies of telling, they interfere on the scene and effectively secure intelligibility for new material feminism. In other words, they don't just peer into feminism, but interfere with and operate to structure the givenness of feminist assumptions. The diffractive readings that seek "interference patterns" then, should imply a "new optics" that looks not simply to "the text" for its merely literary operations (diffraction as an "apt" metaphor), but to the wider sets of material practices that produce visualizations such that these appear to exist "within" the text.

I think it is important to pause briefly to note that Barad herself never wields these types of rhetorical strategies against Butler. On the contrary, as I pointed out earlier, Barad refuses to critique Butler's work in any serious way, and in fact refers to her treatment of the nature of exclusions as "necessary and productive." Barad's careful consideration of Butler's concept of performativity provides the ground for anti-representationalist method and is a crucial piece of what formulates the ontological difference between representationalism and diffraction as affirmative critique. Barad's refusal to reject Butler does not, however, prevent other feminists from using Barad's words to reject Butler-language-poststructuralism as enemies of the new approach.

One way that new material feminists perform the rejection of Butler-language-poststructuralism is through the repetition of one specific phrase. The negative comparison between poststructuralism and new material feminism very often includes a citation of Barad's phrase, "Language has been granted too much power." Most frequently, the phrase is found in publications from feminist theory, ecofeminism, animal studies, gender and sexuality studies, and literature, but can also be found in less obvious disciplines like theology (Briggs, 2012), comparative religion (Vasquez 2011), sociology (Tornberg 2013), anthropology (Course 2012; Marshall and Alberti 2014), and education (Holmes and Jones 2016; Murris 2016).[499] I want to

[499] Rachel Holmes and Liz Jones, "Flickering, Spilling and Diffusing Body/knowledge in the Posthuman Early Years," *Posthuman Research Practices in Education* Edited by Carol A. Taylor and Christina Hughes (London: Palgrave Macmillan UK, 2016), 108-27 114: "Posthumanism could be understood as a theory of 'replenishment' compensating for post-structuralism's theoretical acute focus on language. And while this chimes with Barad's statement that 'Language has been given too much power' we want to understand language as molecular…". Sheila Briggs, "What Is Feminist Theology?" *The Oxford Handbook of Feminist Theology*, Edited by Mary McClintock Fulkerson and Sheila Briggs (Oxford: Oxford University Press, 2013), 73-106: "Although, as Barad complains, language has recently been given too much power in feminist theory, narrative has not. The suspicion that narrative suggests a cohesion that gives rise to the sense of a unitary self is not unfounded." Karin Murris, *The Posthuman Child: Educational Transformation through Philosophy with Picturebooks* (London: Routledge, 2016): 87: "The idea that childhood is a social construction is symptomatic of the 'linguistic turn'. Barad argues that 'matters of "fact" (so to speak) have been replaced with matters of signification.' Language has been granted too much power. The power of language has not only been substantial, but also 'substantializing,' allowing linguistic structure to determine our understanding of the world." Manuel A. Vasquez, *More than Belief: A Materialist Theory of Religion* (Oxford: Oxford University Press, 2011), 155: "Radical feminist constructionists run the danger of reinscribing the culture and nature split, as well as the sharp divide between humans and nonhuman nature….[T]his has made it difficult for feminists to dialogue productively with…the natural sciences….Karen Barad writes: 'Language has been granted too much power…' It is one thing to recognize that the world discloses itself to us through the contested webs of signifiers we articulate and quite another to assert that language is all there is." Vasquez says Barad "echoes" Hekman. Jasbir Puar, "'I'd Rather Be a Cyborg than a Goddess': Becoming Intersectional in Assemblage Theory," *Literary Theory: An Anthology*, Edited by Julie Rivkin and Michael Ryan (Winchester, West Sussex: John Wiley & Sons, 2017), 1007: "Karen Barad writes: 'Language has been granted too much power'…Categories—race, gender, sexuality—are considered events, actions, and encounters between bodies

suggest that this phrase is cited so often that it, too, operates as a ready shortcut in new material feminist discourse to exclude anything related to poststructuralism or language. The negative comparison to poststructuralism produces an anxiety around the takeover of "language" that has "reduced everything to language and culture."[500] By simple negative association, the phrase distinguishes the author as novel and more legitimate than those cited from the past. If the anxiety surrounding language has led to a quick and facile "rejection" of anything that smells like language, and if Butler stands in for language, then we have to assume by association that "Butler has been granted too much power."

By means of this logic, the old hero of gender is the new villain of materialism. Hekman argues that the advantage of Karen Barad's work for feminism is precisely her critique of the linguistic turn. Hekman insists that Barad "throws down the gauntlet against the current orthodoxy," and finally puts an end to all those feminists who were "blinded" by their focus on "unconstrained play" of linguistic constructivism, and merely reinscribed the dualisms they claim to deconstruct.[501] Citing the key phrase, "Language has been given too much power," Hekman tells the story of Barad as the lone warrior who has finally triumphed against the decades-long fight against constructivism and (by association) Butler. Barad stands out clearly as the conqueror: she's a marker for and proof of the flawed history of feminism; she signifies the death of poststructuralism and the turn to a new more flexible approach. Characterized as the one

---

rather than simply entities and attributes of subjects." Anton Törnberg, "Resistance Matter (s): Resistance Studies and the Material Turn," *Resistance Studies Magazine* (2013): "According to these new material theorists, language has been given too much power. This has been expressed by Barad (2003), stating that, 'Language matters. Discourse matters. Culture matters.'" Rebekah Sheldon, "Matter and Meaning." *Rhizomes: Cultural Studies in Emerging Knowledge* 30 (2016): "…we recognize a longstanding argument about the causal structure of representation, the argument Barad enters into so decisively in her 'Posthumanist Performativity' with its emphatic first sentence: Language has been given too much power.'"
Lynda Birke, Mette Bryld, and Nina Lykke, "Animal Performances An Exploration of Intersections between Feminist Science Studies and Studies of Human/Animal Relationships," *Feminist Theory* 5.2 (2004), 801: "Barad (2003), however, begins her reworking of ideas of performativity by noting that, in recent theoretical work, 'Language has been granted too much power.' Relatedly, even though we might seek to challenge the premises on which the concept 'animal' is founded, discussing only how the word is used still leaves non-human animals as rather passive participants in the creation of meaning." Claudia Aradau, "Security That Matters: Critical Infrastructure and Objects of Protection," *Security Dialogue* 41.5 (2010), 495: "She starts her seminal article on posthumanist performativity with a brief sentence: 'Language has been granted too much power.' In contra-distinction to linguistic understandings of performativity, Barad proposes an account of posthumanist perfomativity which incorporates important material and discursive, social and scientific, human and nonhuman, and natural and cultural factors." Yvonne Marshall and Benjamin Alberti, "A Matter of Difference: Karen Barad, Ontology and Archaeological Bodies," *Cambridge Archaeological Journal* 24.01 (2014) 19-36. Magnus Course, "The Birth of the Word: Language, Force, and Mapuche Ritual Authority," *HAU: Journal of Ethnographic Theory* 2.1 (2012), 1-26. Maria Udén, "A Located Realism: Recent Development within Feminist Science Studies and the Present Options for Feminist Engineering," *Women's Studies International Forum* 32.3 (2009), 221: "In focusing on language however, Keller leaves out much of the interaction scientists (and engineers) involve themselves in. The somewhat younger Karen Barad has prioritized differently. She holds that feminists and scientists alike have struggled with over-emphasis on social constructions as fundamental for the human world, and she is the most prominent writer to catch the sense of frustration the Sokal hoax expressed, opening an article as she did, with the straight forward assertion that: 'Language has been granted too much power' (Barad, 2003: 801)." Jessica E. Brophy, "Developing a Corporeal Cyberfeminism: Beyond Cyberutopia," *New Media & Society* 12.6 (2010), 936: "Some authors have criticized Butler's performativity as granting too much power to language, though the same argument has been leveled against social constructivism."
[500] Sara Ahmed, "Open Forum Imaginary Prohibitions: Some Preliminary Remarks on the Founding Gestures of The New Materialism," *European Journal of Women's Studies* 15.1 (2008), 23-39.
[501] Hekman, *Material Feminisms*, 102-103.

feminist who stands out from the rest, the only individual capable of conquering the monstrous enemy, Karen Barad emerges as the new hero of feminism. New material feminists would do well to note that although Butler was once conceived of as a "threshold figure" and a marker of sophistication, that did not prevent her eventual "failure" upon the rise of new materialism. Barad is held up now as a marker of scientific sophistication that clearly surpasses Butler's "merely discursive" skills, but her continued success is not guaranteed.

Barad never asked for the militaristic metaphors. She neither "rejects" language nor Butler, but these new materialist technologies of telling enlist the operative of rejection and thus create the contours of a new materialist approach. As I explained in Chapter 2, Barad is specifically concerned to address the role of language in recent theories of social constructivism that require linguistic mediation.[502] Like Butler before her, Barad attacks reductionist theories of social construction. She argues that humanist theories of social construction depend upon two mistaken assumptions that lead feminists to view language as a mediation between words and things: first, that human individuals inhabit a realm separate from the world; and second, that as separate, human language represents and corresponds to the world. The notion of separation is an ontological presupposition held by theories of social constructivism, which is maintained by any theory of language that remains representational. It is not "language" that Barad rejects, but the monolithic and hegemonic characterization of language as a mediating force. When language is "rejected" by new material feminist discourse through these rhetorical strategies, it is functionally separated from the materials that matter for feminism. And it does so by analogy, that is, by characterizing feminist theory and criticism as a war between enemies.

In my analysis so far, I have pointed to some specific rhetorical exclusions made by individual writers. Hemmings prefers not to place "blame" on individuals. Instead, she points to the material practices of editing and publishing that allow the glosses to be published without clarification. The lack of citation, she insists, is what allows for the generalizations, and for a dominant story of feminism's past to emerge as legitimate. The authority to review and publish a manuscript or article lies, Hemmings argues, not with the individual argument, author, or feminist, but rather, with the system of publication. "Blame" or agency lies with systems, not individuals, according to Hemmings. While Hemmings argues that the rhetorical strategies in feminist writing are "material practices," her conceptualization of rhetoric and writing stems from the Marxist tradition that understands materiality in economic terms. The tradition of Marxist feminism underlies Hemmings argument for the materiality of writing, and falls in line with material feminism that seeks to uncover "the material conditions under which social arrangements, including those of gender hierarchy develop."[503] This form of material feminism is inherently humanist; it focuses on an analysis of the existing modes of production and the organization of individuals positioned within it, and ultimately, in acquiring the freedom of those individuals.

New material feminism distinguishes itself from the "old" material feminism mainly through its posthumanism. Marxist theories are anthropocentric and their analyses are based solely on human labor and value. An account of the ways in which new material feminism emerged from older traditions history of materialism and material feminism is beyond the scope of this discussion, but it is nevertheless important to acknowledge the constitutive nature of that history—however it is told. As Hemmings points out, the particular rhetorical means by which

[502] Barad, *Meeting the Universe*, 133.
[503] Margaret W. Ferguson and Jennifer Wicke, *Feminism and Postmodernism* (Durham: Duke University Press, 1994).

contemporary feminism "returns" to the writers of the past contributes to the construction of our contemporary understandings of feminism.[504]

For the moment, I simply want to suggest that the relations between materiality and writing need not be understood solely or primarily in terms of its economic modes of production. Barad's theory of agential realism replaces the economic analysis with a broader analysis of the physical substance of bodies and the world more generally.[505] Barad's "new" materialism distinguishes itself from the "old" materialism by bringing ontology center stage, to analyze that which exists and "the reality of matter, space and time."[506] New materialism thus refuses to exclude things previously excluded because they were held to be "social and psychic" or "immaterial"—things such as ideas, concepts, theories, and language—from the materiality of the world. New materialism does not attribute cause to the economic modes of production, but rather theorizes agency as dispersed across wider phenomena (see Chapters 1-2).

Given the war on language in new material feminist discourse, it has been nearly impossible to analyze its role for new materialism, or to suggest that language and writing operate "as material" in ways other than the economic mode of production. Language and writing are ripe for further "new" material examination. I have shown that there are various technologies of telling operating in diffractive readings that have been bracketed out or excluded from the range of vision, are exclusions mattered for new material feminism. Although Barad presents a theory of "posthuman performativity," the exclusions operating in the diffractive method have allowed it to emerge in a particular way, and have aborted the potential for a non-representational mode of writing to emerge within it. As it is currently practiced in new material feminism, the diffractive method operates as a representational reading practice that produces images or view of the world from a critical position outside the text. In Chapter 3, I argued that it was writing that would allow new materialist feminists to "bring the material back in" to feminism. Here I have suggested that the diffractive mode can be utilized as performative rather than representational, and thus offer new material feminism some ways to consider rhetoric and feminist writing as *directly* material.

The way we theorize the precise nature of rhetoric and writing as material is important given that, as Hemmings reminds us, each rhetorical gloss or shortcut is "an act of disavowed epistemic violence that takes attention away from the contest, the political investments."[507] The rhetorical glosses found throughout new material feminist discourse *matter* because they are evidence of the ongoing violence, the contest for what counts,[508] in feminist theory. Relations between feminist approaches and even individual feminists are characterized as enemies. Wars are waged in feminism.[509] These particular exclusions of violence structure new material feminist methods. The exclusion of exclusions paves the way for affirmative critique to emerge.

---

[504] For an important discussion of this genealogy, see Myra J Hird, "Feminist Matters: New Materialist Considerations of Sexual Difference," *Feminist Theory* 5.2 (2004): 223-32; Gill Jagger, "The New Materialism and Sexual Difference," *Signs: Journal of Women in Culture and Society* 40.2 (2015), 321-42.

[505] Maureen McNeil, "Post-Millennial Feminist Theory: Encounters with Humanism, Materialism, Critique, Nature, Biology and Darwin," *Journal for Cultural Research* 14.4 (2010), 427-37.

[506] Ibid., McNeil quoting Grosz.

[507] Hemmings, "Telling Feminist Stories," 118.

[508] See Haraway, Donna. "Reading Buchi Emecheta: Contests for Women's Experience in Women's Studies." *Women: A Cultural Review* 1.3, 1990: 240-55

[509] See Van der Tuin, "On The Threshold of New Materialist Studies," *FORUM: University of Edinburgh Postgraduate Journal of Culture & the Arts*. No. 19. (2014).

War is precisely what Barad renounces. Her diffractive method is an alternative to negative critique, and negativity is what she explicitly rejects. Nowadays, critique is a "practice of negativity," Barad says, a mode that is all "about distancing and othering." Critique has become a destructive habit, a practice that is "meant to dismiss, to turn aside, to put someone or something down—another scholar, another feminist, a discipline, an approach, et cetera."[510] She agrees with Bruno Latour that "critique has run out of steam," and proposes the diffractive method as an alternative practice that contributes to his call to dismantle "the critical weaponry so uncritically built up."[511] Notice that Latour also characterizes critique as a destructive weapon. Latour runs with the war metaphors throughout his entire essay. "Wars. So many wars. Wars outside and wars inside… My question is simple: Should we be at war, too, we, the scholars, the intellectuals?" He wonders whether we shouldn't "bring the sword of criticism to criticism itself"; he calls Baudrillard "a marshal of critique" and laments "the cruel treatment objects undergo in the hands of… *critical barbarity*." He says that it will not be easy to "dismantle [the] critical weaponry" because long after they have been stored, they "still dangerous," like "atomic silos." Latour quotes Whitehead on the return to metaphysics; it's "like throwing a match into a powder magazine. It blows up the whole arena." Latour utilizes endless war metaphors, and yet ends on an entirely different note: "The practical problem we face," he says, "is to associate the word *criticism* with a whole set of new positive metaphors, gestures, attitudes, knee-jerk reactions, habits of thoughts."[512] I find it very curious that Butler and Barad, poststructuralism and new materialism are everywhere the discourse envisioned as "enemies at war," when Barad's transparent goal for diffraction is the just the opposite. Feminist science studies, Barad contends,

> focuses on the possibilities of making a better world, a livable world, a world based on values of co-flourishing and mutuality, not fighting and diminishing one another, not closing one another down, but helping to open up our ideas and ourselves to each other and to new possibilities.[513]

Barad doesn't play around with the violent metaphors. She says they are too "chilling and ominous" for feminist engagement.[514] Her alternative to negative critique is diffraction, which is a form of "affirmative" critique. What does affirmation mean for new material feminism, and from where does it emerge? In the next section, I will examine the facets of affirmative critique.

## An Era of Affirmation

According to Maureen McNeil, contemporary feminism has witnessed something of a "reorientation" of feminist thinking and has recently hit a "strikingly affirmative phase in feminist theory."[515] Mercedes Bunt calls it, for lack of a better term, the "era of affirmation."[516] In my analysis of diffraction readings (see Chapter 1), I noted that many characterize their practice as "affirmative critique." These readings, I argued, often use diffraction as a wave

[510] Barad, "Intra-actions," Interview by Adam Kleinmann.
[511] Latour, "Has Critique Run Out of Steam?"
[512] Ibid.
[513] Barad, "Erasers and Erasures."
[514] Barad "Intra-actions," Interview by Adam Kleinmann.
[515] Maureen McNeil, "Post-Millennial Feminist Theory: Encounters with Humanism, Materialism, Critique, Nature, Biology and Darwin," *Journal for Cultural Research* 14.4 (2010), 427-37.
[516] Mercedes Bunz, "Facing Our New Monster."

analogy to identify the "differences that matter," and yet ultimately tend to "smooth over" the differences, and privilege sameness and continuity.

One of those readings was Melanie Sehgal's "Diffractive Propositions: Reading Alfred North Whitehead with Donna Haraway and Karen Barad." Her essay opens with a reference to the physical phenomenon of diffraction:

> A stone drops into the water, disturbing its calm surface. The ripples caused by the wave splash form amplifying circles. A second stone drops. The new circles of water waves interfere with the first, thus forming a pattern.[517]

Although Sehgal claims that in any convergence of thinkers, the friction between their ideas should never be "explained away," and she expressly states that she does not seek to argue that Whitehead was "really" doing diffraction all along, nevertheless, she contends, Whitehead's "propositions are diffractive," and "they matter *because* they are diffractive."

Sehgal notes the "surprising convergence of these heterogeneous thinkers," saying that "just like Barad today," Whitehead, too, was concerned with the philosophical consequences of physics. Like her, Whitehead did not criticize Newtonian physics, but rather the modern view of nature that was derived from it. And although Whitehead seems to promote Haraway's problematic notion of "the view from nowhere," Sehgal shows how the two can be "reconciled." The similarities between them are numerous, but as Sehgal argues, these similarities are not the main point; rather, she would like to read Whitehead diffractively with Barad and Haraway in order to spell out a "possible entanglement" between them. Since "entanglement" in new material feminist discourse refers to connections and becoming (over separation and being), we see that despite the apparent friction she expects to find between the ideas of Barad, Haraway, and Whitehead, Sehgal ultimately finds "resonance" between the three authors. Here again, in the diffractive method used to study the "differences that make a difference," ultimately a return to "sameness" is secured.[518]

New materialist diffractive readings tend to employ an analogy of diffracting waves that operates to privilege resonance, continuity, and smoothness. The analogy structured by these metaphors indicate a more positive approach, which is not only desirable (no more wars!), but also distinctly "feminist." Diffraction and its waves are posed as a new positive and positively feminist form of "criticality." Kathrin Thiele characterizes it as "a change in attitude" and "an opening up of the whole engagements with difference(s) and differentiality" that also "aims at the multiplication and dissemination of differential powers in order to produce other, unexpected, and (hopefully) less violent interference patterns."[519] This new critique is less violent, more open and for all that, it is also, according to Iris Van der Tuin, "immediately feminist."[520] The takeaway point here is that violence is not feminist, but openness and positivity are.

Van der Tuin explicitly calls her reading an "affirmative" one. In "A Different Starting Point, a Different Metaphysics: Reading Bergson and Barad Diffractively" she says that "reading diffractively breaks through the academic habit of criticism and works along affirmative lines."

---

[517] Melanie Sehgal, "Diffractive Propositions."
[518] KathrinThiele, "Ethos of Diffraction: New Paradigms for a (post) Humanist Ethics." *Parallax* 20.3 (2014): 202-16.
[519] Ibid.
[520] Van der Tuin, "A Different Starting Point." See also Grosz, *Time Travels*, and Rosi Braidotti, *Transpositions on Nomadic Ethics* (Cambridge: Polity, 2012).

She says her "affirmative take" on Bergson is part of the "affirmative phase of feminist philosophy" that stems from Elizabeth Grosz and Karen Barad and that this method is "immediately feminist."[521] Van der Tuin's approach to diffraction as an affirmative method does not highlight and extract Bergson's "hypermasculine theory of life and corresponding devaluation of matter as feminine." Rebecca Hill addresses Bergson in the normative feminist manner, according to Van der Tuin.[522] Diffractive strategies, in contrast, do not attend to dualisms (masculine/feminine or criticism/celebration), says Van der Tuin, but rather imply a "reworking" of concepts.[523] The violence of dualisms and the either/or choice they demand, as well as the violent (masculinist) metaphors are dispensed with in diffractive readings. Instead, Van der Tuin provides an image of Henri Bergson and Karen Barad as two diffracted "waves" that "complement each other." Setting up a dualism between the two, she claims, would only result in "the underprivileged coming back with a vengeance."[524] Instead, Barad and Bergson "complement" each other and this "instantiates an affirmative relation between the two, wherein negation… does not play a role."[525] Bergson should not be seen, then, "as a phallocentric philosopher" from whom feminists must distance themselves; rather, Van der Tuin's reading has freed up Bergson for feminist use because he and Barad now have "equal value."[526]

Van der Tuin employs Barad's method of "reading through the diffraction grating" because she claims it is the only form of critique capable of the "respectful engagement" of interference patterns.[527] Together with Peta Hinton, she argues that affirmative critique is a key part of the third-wave feminist politics.[528] In yet another essay, Van der Tuin insists that her response comes from her exceptional "caring for feminism's past, present and future and for new materialism."[529] Theorist of education, Carol Taylor, reiterates this theme, referring to affirmative critique as "engaging critique as a close encounter of the generous kind." Diffraction, Taylor argues, is not meant to "be negative, hostile or destructive, but is "a gentle holding."[530] The employment of the diffractive method is specifically "affirmative" because it directly counters the tradition of negative critique.

But what is it "affirming," exactly? Van der Tuin's diffractive reading of Bergson and Barad has "smoothed over" the rough waters of phallocentrism and offered up a new, more positive or "feminist" version of Bergson. This version of Bergson is positive, according to Van der Tuin, because new material feminists can *overlook* what other feminists have deemed to be a

---

[521] Van der Tuin, "A Different Starting Point."
[522] Ibid. See Rebecca Hill. "Phallocentrism in Bergson: Life and Matter." *Deleuze Studies 2* supplement. In *Deleuze and Gender*, ed. Claire Colebrook and Jami Weinstein (Edinburgh: Edinburgh University Press), 123-36.
[523] Van der Tuin, "A Different Starting Point."
[524] Van der Tuin quoting Barad, "Posthumanist Performativity," 812, n. 14.
[525] Note that Van der Tuin's use of the word "complement" here unfortunately has nothing to do with Bohr's concept of complementarity. Instead, it relies on the colloquial term derived from the Latin *complere*, "to fill up or complete." It is worth noting that both complement and compliment derive from the same verb. *Complement* (from 1610) means "to exchange courtesies." *Compliment* (17th c. French) emerges from "to complete the obligations of politeness." The equal exchange between the Bergson and Barad is conceived implicitly as a "polite exchange." This demand for propriety saturates the discourse of new material feminism, at the expense of engaging with Bohr's theory of language for quantum "objects."
[526] Van der Tuin, "A Different Starting Point," 34.
[527] Barad, *Meeting the Universe*, 90
[528] Peta Hinton and Iris Van der Tuin, "Special Issue: Feminist Matters: The Politics of New Materialism," *Women: A Cultural Review* 25.1 (2014), 1-8.
[529] Iris Van der Tuin, "Deflationary Logic: Response to Sara Ahmed," *European Journal of Women's Studies* 15.4 (2008): 412.
[530] Carol Taylor, "Close Encounters of a Critical Kind."

"hypermasculine" approach. In other words, Van der Tuin's diffractive analysis allows new material feminists to "unsee" the masculinism derived from (i.e., "seen by") now outdated dualisms. This practice of "unseeing" the masculine/feminine dualism is precisely what makes Bergson new and palatable for feminist ethics. For the new material feminists who engage with the diffractive metaphor, negativity is avoided through the metaphor that combines waves in order that the unsavory elements are quietly and politely "washed away," like the tide washes away footprints in the sand. Two contradictory claims thus sit side by side. On the one hand, new materialism "undoes dualisms."[531] That's what makes it "feminist." On the other hand, and in this case, one dualism (feminist/masculinist) is excluded to make way for another more feminist one (positive/negative).

I don't remark on this contradiction for the sake of pointing negatively to the errors, but rather, I want to suggest that the contradiction underlying Van der Tuin's "affirmative" reading of Bergson and Barad highlights the disavowed violence in her exclusion of one dualism for another. These exclusions matter because attention is drawn away from the political investments at stake. Shoved to the background, phallocentrism is de-politicized while affirmation is derived not only as a feminist value based on proprietary associations, but also as the basis of a new politics. Van der Tuin claims that her affirmative critique is "key to third-wave feminist politics." McNeil refers to this material feminism as "post-gender."[532] What makes new materialism "feminist" and "political" is not its critique of phallocentrism or patriarchy,[533] nor its engagement with or recuperation of female authors,[534] as feminist critique has done in the past. New material feminism is also not particularly concerned with the inequities of real men and women, as the "old" material feminism was. Rather, feminism has now "freed" itself so as be able to engage with other, less restrictive, topics.[535] I also do not remark on these political differences between "generations" of feminists to enter that controversial debate already in progress,[536] but again, to ask another question: is it enough to say that new materialism "undoes dualisms, and is therefore 'feminist' by nature?"[537] And what is "new" about new material feminism? The method taken up by new material feminists, affirmative diffraction, operates by means of various technologies of telling to depoliticize the traditional and normative modes of feminist politics. What is thereby "political" about it? McNeil argues that as part of the "ontological turn," new material feminists are more interested in questions of knowledge and the structures of its generation.[538] But if new

---

[531] Peta Hinton and Iris Van der Tuin, "Special Issue: Feminist Matters."
[532] McNeil "Post-Millennial Feminist Theory." McNeil uses the monikers "post-gender" and "post-millennial."
[533] For example, see Hélène Cixous and Catherine Clément, *The Newly Born Woman*, Translated by Betsy Wing (Minneapolis: University of Minnesota Press, 2001); Luce Irigaray and Gillian C. Gill, *An Ethics of Sexual Difference*, Translated by Carolyn Burke (Ithaca: Cornell University Press, 1993); Penelope Deutscher, *Yielding Gender: Feminism, Deconstruction, and the History of Philosophy* (London: Routledge, 2002); Sylvia Walby, *Theorizing Patriarchy* (Oxford: Blackwell, 1991).
[534] For example, see Elaine Showalter, *A Literature of Their Own: From Charlotte Brontë to Doris Lessing* (London: Virago, 1982) and Alice Jardine, *Gynesis: Configurations of Women and Modernity* (Ithaca: Cornell University Press, 1986).
[535] McNeil, "Post-Millennial Feminist Theory," 431.
[536] See Stacey Gillis, Gillian Howie, and Rebecca Munford, *Third Wave Feminism: A Critical Exploration* (Basingstoke: Palgrave Macmillan, 2004); Gillis and Munford "Genealogies and Generations: The Politics and Praxis of Third Wave Feminism," *Women's History Review* 13.2 (2004), 165-82; Jo Reger, *Different Wavelengths Studies of the Contemporary Women's Movement* (London: Routledge, 2014).
[537] This very question was asked by Rachel Loewen Walker at the "Feminist Materialisms" conference in Copenhagen in April of 2012, and is cited in Peta Hinton and Iris Van der Tuin, "Special Issue: Feminist Matters."
[538] McNeil, "Post-Millennial Feminist Theory," 431.

material feminism is no longer interested primarily in questions of sex and gender, can we say that it is still properly "feminist"?

Inquiring into the genealogy of affirmation for new material feminism, I was surprised to discover that the affirmative ethos of diffraction has very little to do with affirmation as it is understood in the history of philosophy that emerges from Nietzsche and Deleuze.[539] This is especially egregious oversight, considering that the origins of "neo-" or "new" materialism are cited by Van der Tuin and Dolphijn as originating from Braidotti and De Landa, who are both Deleuzians. Braidotti explains how she was inspired by Deleuze's re-defining of matter in his "neo-materialism."[540] Instead of following Deleuze's notion of affirmation, new material feminism turns to science studies, specifically to the call made by Bruno Latour to question critique-as-war and to find more positive means of engaging with "matters of concern."

Latour happily employs war metaphors throughout "Has Critique Run Out of Steam?", but ultimately seeks new words to direct our habits of thought. Heidegger uses "gathering," Pickering uses "mangle," and our practical problem, says Latour, is "to associate the word *criticism* with a whole set of new positive metaphors, gestures, attitudes, knee-jerk reactions, habits of thoughts."[541] New material feminists have heeded Latour's call. Their diffractive method opposes the negative tradition of critique and all its violent metaphors, replacing them with their own positive ones. The new feminist method of critique is "affirmative" and it is described as "gentle," "nurturing," "generous," "positive," "respectful," and "polite." Of course, it would be facile to say that the feminist ethos of diffraction is constituted by means of the rejection of critique as negative, and yet that is what I'm saying: the recently formulated feminist politics of affirmation is constituted by means of a prior violence: the exclusion of exclusion and the negation of negation. These acts are subsequently bracketed out, erased from memory. In other words, the conditions of possibility for the emergence of a positive conception of diffraction is the exclusion (and bracketing) of all negativity.

This exclusion matters because it attempts to erase the gender politics that it claims to have surpassed. Diffractive strategies replace violent images with caring ones, negative images with positive ones. The strategies also attempt to exchange feminist politics for the politics of science studies, trading out gender for ontology. Moreover, this new politics of affirmative critique that is ostensibly "post-gender" is simultaneously formulated through technologies of

---

[539] In Nietzsche's project of the transvaluation of values, he is committed to the value of affirmation, expressed in the phrase, "*Amor fati*." Affirmation involves a rejection of nihilism, and life-denying values such as those in Christianity. For Deleuze, affirmation both demands and accounts for a bloody and cruel selection process, as well as the dual movement of critique/construction. In both Nietzsche and Deleuze, as a form of critique, "affirmation" never implies the absence of criticism; on the contrary, for Nietzsche it involves rejection of self-denying values and the articulation of new, life-affirming ones. For Deleuze, it is rather "an active encounter outside of the representational mode." This is precisely the aim of decoherent writing: to operate outside the limits of "the literary text," outside the representational mode, to affirm both connection and exclusions as constitutive. Decoherent writing attends not to the "feminist" values of affirmation, but to those in the history of philosophy (at the risk of an accusation of "masculinism"). See Friedrich Wilhelm Nietzsche, *On the Genealogy of Morals: A Polemic: By Way of Clarification and Supplement to My Last Book, Beyond Good and Evil* Translated by Douglas Smith (Oxford: Oxford University Press, 2008); Deleuze, *Difference and Repetition* and *Nietzsche and Philosophy*.

[540] Braidotti in their interview: "Thus "neo-materialism" emerges as a method, a conceptual frame and a political stand, which refuses the linguistic paradigm, stressing instead the concrete yet complex materiality of bodies immersed in social relations of power… Gilles Deleuze—from his (smoky) seminar room at Vincennes— provided lucid and illuminating guidance to those involved in the project of redefining what exactly is the "matter" that neo-materialism is made of. Things get more conceptually rigorous from that moment on," Dolphijn and Van der Tuin, *New Materialism*, 19-21.

[541] Latour, "Has Critique Run Out of Steam?"

telling that utilize cultural stereotypes of gender.[542] Affirmative critique privileges positive images that are characterized, as I pointed out, as "gentle" operations; for example, Van der Tuin's "care" and Taylor's "generous" and "gentle holding." These are privileged at the expense of the typically negative characteristics, or what Barad calls the "chilling and ominous" nature of critical wars (explosions, weapons, villains and militaristic feminists), and argumentative wars (dismissing other people, and shutting down conversation). In the process of privileging these nonviolent characteristics of diffraction, and promoting instead values of generosity, gentleness, caring, respectfulness and politeness, material feminist regularly utilize metaphors that maintain traditional cultural norms of femininity and masculinity. In other words, the technologies of telling in diffractive methods create a specifically gendered contrast between entanglement and decoherence. Despite the new materialist claims to be part of a "new" politics that is "post-gender" and thus "more free" to consider other topics, their entire discourse is structured around technologies of telling that maintain traditional dualistic formulations of gender.

## Conclusion

As I argued in Chapter 2, the diffractive method operates in new material feminism as little more than a reading practice still bound up in humanism, individualism, and representationalism. In their attempts to bring language and reality into "closer proximity," I argued, they reinscribe the ontological separation of language and reality, an assumption grounded in Newtonian physics. In other words, new materialist discourse has been operating like the "good magician," hiding the exclusionary practices that produce intelligibility for new material feminism. They bracket or erase their own generative gestures that simultaneously do the work of constituting a discourse and an approach called "new material feminism."

In this chapter, I have highlighted more specifically the ways in which particular technologies of telling operate to structure that approach. New material feminist discourse has developed an anxiety around language and its metonymic neighbors, and attempts to reject them all. The rejection is mainly generalized, that is, it pertains to generations or systems of thought rather than to individual thinkers. Judith Butler is the exception. Standing in synecdochically for all of these generalized forms of thought, the name "Judith Butler" also produces anxiety and induces a rejection. These rhetorical exclusions are constitutive; that is, they provide feminist discourse with visualizations they can work with. They are the means by which new material feminists collectively and individually engage in the history, theory, practice and politics of feminism. Although these technologies of telling produce intelligibility for feminism, they must necessarily be erased, since operating representationally requires a disavowal of the hidden operations hat produce visualizations. Despite all the talk about "exclusions that matter" in new material feminism, all forms of negativity are frowned upon. The "new" in new material feminism explicitly signals a break from both Marxist feminism, and traditional forms of critique. It also signals a new politics, one that is "freer" in its "post-gender" concerns. This new material feminist freedom sends its practitioners out to develop more positive modes of engagement with the world. Following Barad's affirmative critique, the diffractive method, which is characterized as gentle, polite, generous, respectful, and caring, new material feminists create this new politics. However, at the same time new material feminism "affirms" its feminist values, it simultaneously enlists rhetorical strategies that exclude any concept or term that would metaphorically signal traditional cultural stereotypes of masculinity. Thus associated with "the

[542] See Emily Martin, "The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-female Roles," *Signs: Journal of Women in Culture and Society* 16.3 (1991), 485-501.

masculine," exclusion necessarily implies violence; any exclusions that new material feminists perform, then, must be "overlooked" as non-feminist. In the name of feminist affirmation, all exclusions—even necessary and productive exclusion—must be disavowed.

As I showed in Chapter 3, rhizomatics emerged as a general analytic by means of its practices of scaling up that effectively "erased" writing from rhizomatics. I warned that diffraction is heading in the same generalizing direction, and if it succeeds, new material feminism could completely erase writing from the diffractive method. We can already see this happening with the repeatedly cited Baradian phrase, "language has been given too much power." In order to prevent this scaling up move, I maintained the importance of writing for rhizomatics, and argued that we could reclaim it for the method of diffraction as well. I suggested an experimental form of "decoherent writing" that might work in concert with diffractive methods of reading "for differences that matter." In order to tease out more details of what decoherent writing might look like in practice, in this chapter, I pursued the constitutive nature of rhetorical practices and focused in on the ways in which these rhetorical maneuvers produce constitutive exclusions. In other words, I'm hoping to enact a decoherent writing practice for new material feminist discourse.

Diffraction reconfigures the entire apparatus of seeing, of creating visualizations that operate on the world rather than merely describe the world as it "really" is. The operations and practices involved in critique, which are largely done in writing, must be taken into account as material practices or technologies of telling that are performative. Critique is exclusionary, and necessarily so. To deny its exclusionary powers is to return critique and writing to the Newtonian assumptions of humanism, individualism, and representationalism. If we are to reconfigure criticality, we must, as Barad said of Butler's discussion of exclusion, treat of the nature of exclusions as "necessary and productive." We cannot exclude performativity and decoherence from the critical practices of new material feminism. If we take Barad's critique of critique seriously, then we must seek to create more than affirmative diffraction as it is currently envisioned. The concept of decoherent writing attempts to move toward this non-representationalist mode of critical practice.

## In Conclusion

Engaging in an all-out attack against the enemy of poststructuralism, new material feminism has eschewed language and made the turn toward science in order to "bring the material back in" to feminism. Specifically, feminists turn to embrace the quantum science in Karen Barad's theory of agential realism, and are enticed by her diffractive method which offers an alternative to the tradition of negative critique. However, as I have shown in this dissertation, the diffractive method is predicated on a selective reading of physics that is deeply invested in a particular version of quantum physics that valorizes entanglement. This myopic attention to entanglement and its associations with connection and inclusivity are part of the affirmative ethos of the diffractive method that new material feminists find so attractive. As a "critique of critique," diffraction hopes to displace the tradition of negative critique, opening it up to a new attitude that is "more positive" and "less violent." However, what new materialism fails to acknowledge is the means by which diffraction becomes positive: the exclusion of negative others (language, poststructuralism, dualisms, and so on) is the condition of possibility for affirmative diffraction. In other words, positive affirmation emerges as positive only by means of a double violence, specifically, the negation of all negativity.[543] What I tried to do in Chapter 4 is take stock of the numerous rhetorical exclusions that produce this new optics for diffraction.

One question that emerges from this investigation is whether or not a routine "undoing of dualisms" is "material enough" for new material feminism. Doesn't this de-constructive textual practice of affirmative reading serve to widen, rather than bridge, the gulf between the humanities and the sciences? In other words, isn't it misleading to employ the physical phenomenon of diffraction and then subsume it in a literary practice that still presumes the separation of words and things? To answer these questions, I have therefore suggested a more precisely *material* mode of engagement between feminism and science that goes beyond the interdisciplinary "borrowing" of scientific concepts to create a new lens for looking at feminism. The notion that concepts travel across disciplines has become quite commonplace,[544] and yet not only maintains the very critical distance that diffraction ostensibly eliminates, but also and importantly assumes that feminism has "some stable existence prior to the cultural field that it negotiates."[545] This dissertation has explored the possibilities for feminist analysis to move beyond using diffraction as a "mere" metaphor borrowed from science, as yet another literary interpretation, as a positive critical perspective, or a lens through to which to see the world differently. Instead, I have proposed diffraction to be an experimental practice that moves language and writing toward a non-mediating mode and treats them as productive entities in the world rather than isolated non-entities that can only correspond to the world. I accomplished this in Chapter 2 by pulling feminism into orbit with the measurement problem in quantum physics.

It should come as no surprise that non-scientists find quantum physics difficult and mysterious or "spooky." But even to quantum physicists themselves, the measurement problem remains mysterious. For if the universe is composed of laws in which particles have properties like position, velocity, and mass, then what accounts for the fact that in repeated experiments particles do collapse upon being measured, every time? Physicists cannot explain the impact of

---

[543] For the violence of the excluded other, see Derrida, *Positions*, 42-44: "…in a classical philosophical opposition we are not dealing with the peaceful coexistence of a vis-à-vis, but rather with a violent hierarchy. One of the two terms governs the other…or has the upper hand."

[544] For example, see Mieke Bal, *Traveling Concepts in the Humanities: A Rough Guide* (Toronto: University of Toronto, 2002).

[545] Barad, *Meeting the Universe*, 213.

measurement. It is precisely this gap in the physics discourse that I find productive for thinking about the relations between the physics and feminist critique. Everything that is puzzling about quantum physics comes down to the transition between indeterminacy and a determined state, or the moment of actualization. Measurement seems to "cause" the collapse of a wave into a particle, and yet we know this is absurd. The problem for quantum physics is to figure out exactly how measurement intervenes on the normal state of systems (indeterminacy) to localize it. In doing so, we must remember that interference works differently in classical and quantum physics; it is not a disturbance phenomenon initiated from outside, rather, measurement acts as an "exteriority within" to pull the nonlocal (everywhere and nowhere at once) into the local (the here and now of a singular entity).[546]

Using this notion of the measurement within, I examined the nature of the tools that make up this measuring apparatus. The Stern-Gerlach experiment (Chapter 2) demonstrates just how far any given iteration of an experimental apparatus can extend. It is not merely the physical and scientific tools of an experiment, nor merely human (and directly causal) disturbance to the experiment set, but rather all human and non-human entities (that are dispersed and equally real) involved in the experimental constellation that contribute to scientific intelligibility. As the Stern-Gerlach experiment shows, the interference of the measurement apparatus even includes entities such as the gender and class of a scientist in the lab, and notably in this case, the sulfur in his cheap cigars. Barad's cultural study of scientific practices is feminist, then, in that it demonstrates the dispersed nature of the apparatus and problematizes the myriad distributed elements, including sexed and gendered aspects. Being able to "see" these dispersed sex and gendered elements as a whole, or attaching those qualities to a given individual arguably becomes beholden to yet another visualizing apparatus.

Niels Bohr suggests that even language operates as an entity in the measurement apparatus. Bohr argues that scientists need both a logical and a terminological adjustment with respect to their quantum entities. The notion that the term "particle" or "wave" corresponds to a real object is the result of assumptions imported from representationalism. But the universe does not operate this way, Bohr insists, since properly speaking, there are no quantum "objects." The role of language is crucial to the scientific experimental apparatus, because along with the quantum "objects" they describe, the words themselves participate in the extended apparatus. This constellation of entities that comprises the measurement apparatus intervenes on the normal state of systems (indeterminacy) to agentially separate them from within. In other words, language also has a material mode when it is placed into the measurement apparatus that produces "things" from phenomena.

Taking writing, then, as one of many "entities" in the measuring apparatus that contribute to scientific intelligibility, this dissertation has tried to lift writing from its merely representational role in feminist reading and writing practices and to uncover a new role for writing, one that is non-mediating and directly material. Writing is not monolithic, but rather, is opened up by recognizing its place in the apparatus; we can now see that writing includes a dispersed set of practices and a diffuse agency which makes it difficult to identify. As one of many entities in the measuring apparatus, it is part of what constitutes "exclusions that matter." It is in this sense that I consider writing to be "experimental." Surely it is experimental in the literary sense, that is, as a questioning of its own limits. But more than that, this notion of "experimental" or "decoherent" writing exceeds its normal representational limits, becoming material, real, and integral to the measurement apparatus and the emergence of "things."

[546] Barad, *Meeting the Universe*, 177.

I have thus exported the notion of experimental writing from the laboratory and placed into the context of feminist reading and writing practices. I suggested that exclusions can be taken to indicate that a measurement has occurred (Chapter 3). Applied to the context of new material feminist discourse and the oft-repeated phrase "exclusions matter," I looked to specifically written types of exclusions, both in terms of publishing and rhetoric in feminist discourse. They matter, I showed, precisely because their exclusions indicate a measurement, in other words, an interference into the norm of indeterminacy that operates to produce a localized "thing." In focusing on entanglement at the expense of decoherence, I argued that new material feminism works toward a lopsided notion of inclusivity, but has failed to pay proper attention to the ways in which its own writing practices operate to exclude. New material feminism has therefore also excluded the ways in which it might consider itself as a "real" discourse. As I noted in the introduction to this dissertation, the goal of the COST New Materialist Network is to "insist that there is something real that drives the invention of this novel kind of abstract vocabulary."[547] However, this logic assumes that only the matter "underneath" abstractions produces them, leaving the abstractions "themselves" separated from the realms of both materiality and reality. Paying attention to the exclusions that matter, we have unearthed particular types of measuring actions that indicate the localization of the real. In other words, exploring decoherence and the measurement apparatus, it is possible to consider the thinking and writing involved in feminist theorizing as involved in the real, that is, as really mattering.

Every measurement is a particular kind of exclusion that Barad calls "cutting together-apart."[548] Every measure includes and excludes certain things *at once*. Placing too much emphasis on inclusion, connection, and sameness, new material feminism's affirmative critique proposes to smooth over negativity, but in the very same gesture, disavows the very exclusions that are its own conditions of possibility. These written exclusions contribute to intelligibility, to the production of what counts for feminism.

Ultimately, we must confront the political problem that emerges in and through writing for new material feminism, a problem which has not yet been addressed. Each hidden exclusion is not only productive, but according to Clare Hemmings, is also "an act of violence that takes away from the contest, the political investments."[549] New material feminism swiftly excludes language in order to transform feminist critique, but turns a blind eye to its own constitutive exclusions. Given this, I suggested that the diversionary tactics are an attempt to divest new material feminism of real political accountability. Rendering invisible their exclusionary practices, and smoothing over the differences, diffractive readings reveal a disturbingly apolitical trend in "post-gender" feminism.

The stakes, therefore, of theorizing and putting into practice an experimental mode of language are directly material and immediately political. I have demonstrated one way that language continues to matter for feminism, and should not be so hastily rejected because "language has been granted too much power."[550] Considering that measurements "don't just peer, but interfere,"[551] this should remind us to consider the precise ways in which our own diffractive reading and writing practices produce measurements through constitutive exclusionary practices. We would do well to scrutinize our own evaluations, which are always

[547] COST New Materialism, "Memorandum of Understanding," http://www.cost.eu/COST_Actions/isch/IS1307?
[548] Barad, "Diffracting Diffraction: Cutting Together-Apart."
[549] Hemmings, *Why Stories Matter*, 118.
[550] Barad, *Meeting the Universe*, 132.
[551] Hacking, *Representing and Intervening.*

tied to political investments. As Donna Haraway reminds us, no reading is ever just there for the taking: "reading practices are far from innocent…[R]eadings must be engaged and produced; they do not flow naturally from the text."[552] What comes to count in feminism, she argues, does so through "the search for specificity, heterogeneity, and connection through *struggle*."[553] It is these contests that do the mattering of feminist critique, but the rhetoric of the material turn continues to exclude any account of struggle, violence, contestation, or anything else that is opposed to the positive ethos of affirmation. After pointing to their clear bias toward a lopsided notion of connection, I clarified some aspects of the actual wars being waged within the reading and writing practices of new material feminism, and also pointed to some of the winners and losers (inclusions and exclusions) that matter for the discourse.

To point to the exclusions, however, is not the end of the story. For after each battle is fought, what has been left out can be reclaimed by mapping out the traces of the victor's exclusions. Returning to what was excluded is nothing new for feminist critique, which has a long history of seeking out the lost experiences of marginalized figures, especially women writers.[554] As a genealogical practice of tracing the exclusions that matter, decoherent writing is heavily indebted to this feminist practice. Bringing to light the hidden violence of previous exclusions reveals the contest for power and the political investments of a given exclusion. As I described in Chapter 4, our technologies of telling help to structure the stories we tell about feminism; they structure feminist discourse, history, theory, practice, and politics. In particular, the manner in which we "return" to the texts of the past also structures our understanding, as Hemmings has argued. Entities such as "generations" and "paradigms" are constituted in feminist discourse to explain wider phenomena. Sara Ahmed has addressed the problems that these generalizing shortcuts accomplish. When we return to works of the past, Ahmed says, we need to stop generalizing the issues in order to

> consider how it is that we arrive at the grounds we inhabit, we need to appreciate the feminist work that comes before us, in all its complexity. We don't always have to make a return to earlier feminist work, but if we represent that work as being this or that, then we need to make that return. Such a return would be ethical: we should avoid establishing new terrain by clearing the ground of what has come before us."[555]

Ahmed and Hemmings both warn feminists about the risks involved with generalizing what feminists have said in earlier texts because it ignores the history and true complexity in texts written by women. The solution, according to Ahmed, is to read women's texts more closely. Texts written by men receive more attention, she says, and thus more complexity is attributed to their ideas. While this may very well be true, Ahmed's solution clearly remains tethered to the interpretive mode of reading. For her it seems that the stakes of feminist reading practices are mainly concerned with equity; women writers deserve to be given "equal time" and "equal treatment" which would reveal their complex thinking.

---

[552] Haraway, "Reading Buchi Emecheta."
[553] Ibid., 109, emphasis in the original.
[554] For example, Hélène Cixous and Catherine Clément, *The Newly Born Woman*; Sandra M. Gilbert and Susan Gubar, *The Madwoman in the Attic: The Woman Writer and the Nineteenth-century Literary Imagination* (New Haven: Yale University Press, 1979); Alice Jardine, *Gynesis*. Toril Moi, *Sexual/Textual Politics*; Elaine Showalter, *A Literature of their Own*.
[555] Ahmed, "Imaginary Prohibitions."

Ahmed's argument presumes first, that one could eliminate exclusionary practices, and second, that this elimination would be beneficial for feminism. It also conforms to the "positive" impulse in new material feminism. Her ethical argument does not begin to contend with either the ontological or political stakes of such exclusions. I suggested that any "return" to earlier texts is not merely an interpretative practice, but is also a material and political one. The genealogical diffractive method that I proposed is a practice of rendering visible the invisible practices of representation and visualization whose exclusions contribute to intelligibility. It is not possible to simply "eliminate" exclusions, for they are not only necessary, but also productive.[556]

I modeled this method of diffraction as genealogy in Chapter 3, tracing out two specific "losers" in the contest for meaning. I turned to the texts of Deleuze and Guattari in order to "reclaim" two exclusions that mattered: "the book" that was excluded from rhizomatics and "decoherence" that was excluded from the diffractive method. Next, I drew these two former exclusions together, tracking down the nature of what it means to write. For Deleuze and Guattari, to write is "a style of participating in the transformations of differentiation."[557] My reclaiming of writing has demonstrated materiality, and reinforced the notion of critique as "interference" from within, as opposed to a distant view of what is separate from it. But what are the political and temporal implications of reclaiming these exclusions?

Ahmed recognizes the importance of reclaiming excluded voices, marginalized histories, and forgotten experiences. But her notion of reclaiming falls in line with representationalist assumptions; for her, returning to the texts of the past is merely a matter of comprehensively filling in lost meaning through ongoing re-interpretation. But can we simply reclaim these constitutive exclusions from the past? How does one give voice to or do justice to the past? And where is this past, how is it accessible when we take into account its place in the diffractive apparatus? This dissertation leaves off here, with the question of temporality. Just as our reading practices are far from innocent and do not flow naturally from the text, Barad argues that even our concepts of space and time are not simply "there for the taking." Time does not "exist prior to the intra-actions that reconstitute entanglements."[558] Concepts do not simply exist, but must be built, and thus time can never be understood to exist consistently or independently. Therefore, readings that "return to the past" are far from simple. An investigation into the temporal notions in quantum logics and how those would play out for diffractive readings for constitutive exclusions have not been addressed here, but are crucial to understanding the diffractive method and its "returns." For example, Iris Van der Tuin returns to the texts of Henri Bergson hoping to make his ideas more palatable for feminism, but how is time accounted for in that return? How might writing and its constitutive exclusions interfere with our current notions of temporality or construct alternate ones? Or put another way, what exclusions contribute to the mattering of time? Furthermore, what are the performative relations between writing and its temporal iterations?

Quantum diffraction and decoherent writing, then, are necessarily bound up in the project of "returning" to excluded pasts. An important question that emerges from this is whether or not the shift of emphasis from issues of sex and gender in lived bodies and their practices to abstract concepts and the pursuit of onto-epistemology makes new material feminism "feminist enough." New material feminists don't generally critique phallocentrism or patriarchy, they don't recuperate women's contributions to science or society, and they don't tend to focus on the

[556] Barad, *Meeting the Universe*,192.
[557] Deleuze and Guattari, *What is Philosophy?,* 8.
[558] Barad, *Meeting the Universe*, 74.

rereading of women's texts. Having "freed" itself from being concerned with the inequities of real men and women in the post-gender age, new material feminism pursues "less restrictive" topics that are grounded in works by male authors from French theory and tend toward the abstract. Whether or not new materialism feminism is actually "feminist" is hard to say. This dissertation has paved the way for thinking about those exclusions that were required in order for new material feminist to consider themselves "free" from the inequalities of real men and women. Decoherent writing is a proposal that attempts to make those exclusions matter, to bring them into sharp focus. This project is materially invested in giving voice to those bodies that have been marginalized, disqualified, or otherwise discounted in order to make certain bodies (of knowledge) come into view. While new material feminism may not be particularly "feminist," and indeed may even be rehearse patriarchical forms of knowledge production, this dissertation has tried to unearth what has been excluded in the wake of its formation, and for this reason it sets the stage for a feminism that emerges in the shadows of the dominant discourse of new material feminism.

In light of this, the next phase of development for decoherent writing is to "return" to poststructuralist feminist writers who, in recent years, have been largely cast aside as quaint remnants of our theoretical past. The French feminists who employed *écriture féminine*—Hélène Cixous, Luce Irigaray, Julia Kristeva, Monique Wittig, Chantal Chawaf—were originally critiqued for essentializing the body and privileging theory over politics; now they are critiqued by new material feminists for their privileging of language at the expense of the material. I propose to provide close readings of these excluded works, and following Ahmed, to give them equal time and equal treatment, thus recuperating them as marginalized figures, as well as avoiding the dangers of generalization. However, filling in meaning through the ongoing re-interpretation of lost texts is only the beginning of developing an experimental practice of writing. Decoherent writing requires complicating the familiar feminist mode of recuperating lost bodies by returning to the past. That past is not simply there for the taking, but is itself produced in the very act of re-turning. What, therefore, will it mean to return to excluded feminist texts and how does any given return matter?

## Works Cited


Abel, Marco. *Violent Affect Literature, Cinema, and Critique After Representation*. Lincoln: University of Nebraska Press, 2009. Print.

Aeschylus, and E. D.A. Morshead. *The Oresteia Trilogy: Agamemnon, The Libation-Bearers, and The Furies*. Mineloa: Dover Publications, 1996. Print.

Ahmed, Sara. "Open Forum Imaginary Prohibitions: Some Preliminary Remarks on the Founding Gestures of The New Materialism." *European Journal of Women's Studies* 15.1 (2008): 23-39. Web.

Alaimo, Stacy, and Susan Hekman, eds. *Material Feminisms*. Bloomington: Indiana University Press, 2009. Print.

Alaimo, Stacy. *Bodily Natures: Science, Environment, and the Material Self*. Bloomington: Indiana University Press, 2010. Print.

Alaimo, Stacy. *Undomesticated Ground: Recasting Nature as Feminist Space*. Ithaca, NY: Cornell University Press, 2000. Print.

Albert, David Z. *Quantum Mechanics and Experience*. Cambridge: Harvard UP, 2000. Print.

Alcoff, Linda. *Visible identities: Race, gender, and the self*. Vol. 10. New York: Oxford University Press, 2006.

Allen, Louisa. "The Power of Things! A 'new'ontology of Sexuality at School." *Sexualities* 18.8 (2015): 941-58. Web.

Allen, Louisa. *Schooling Sexual Cultures: Visual Research in Sexuality Education*. Taylor & Francis, 2017.

Alliez, Éric. *The Signature of the World, Or, What Is Deleuze and Guattari's Philosophy?* Trans. Eliot Ross. Albert and Alberto Toscano. New York: Continuum, 2005. Print.

Antony, Louise M. and Witt, Charlotte, eds. *A mind of one's own: feminist essays on reason and objectivity*. Boulder: Westview Press, 2002.

Aradau, Claudia. "Security That Matters: Critical Infrastructure and Objects of Protection." *Security Dialogue* 41.5 (2010): 491-514. Web.

Aristotle. *Aristotle on Rhetoric: A Theory of Civic Discourse*. Trans. George A. Kennedy. New York: Oxford University Press, 1991. Print.

Auletta, Gennaro, Mauro Fortunato, and Giorgio Parisi. *Quantum Mechanics*. Cambridge: Cambridge University Press, 2009. Print.

Baier, Annette. *Postures of the Mind: Essays on Mind and Morals*. Minneapolis: University of Minnesota Press, 1985.

Bal, Mieke. *Traveling Concepts in the Humanities: A Rough Guide.* Toronto: University of Toronto, 2002. Print.

Barad, Karen. "Posthumanist Performativity: How Matter Comes to Matter." *Signs: Journal of Women in Culture and Society* 28.3 (2003): 801-31. Web.

Barad, Karen Michelle. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham: Duke University Press, 2007. Print.

Barad, Karen. "Erasers and erasures: Pinch's unfortunate 'uncertainty principle'." *Social Studies of Science* 41(3): 443-454. April, 2011. Web.

Barad, Karen. "Interview with Karen Barad." Interview by Rick Dolphijn and Iris Van Der Tuin. *New Materialism: Interviews & Cartographies* 2012: 48-70. Print.

Barad, Karen. "Intra-actions." Interview by Adam Kleinmann. *Mousse Magazine* Summer 2012:

76-81. Web.
Barad, Karen. “Diffracting Diffraction: Cutting Together-Apart.” *Parallax* 20.3 (2014): 168-87. Web.
Baroussa, Alan. *Deleuze and American Literature: Affect and Virtuality in Faulkner, Wharton, Ellison, and McCarthy*. New York: Palgrave Macmillan, 2009. Print.
Barrett, Estelle, and Barbara Bolt, eds. *Carnal Knowledge: Towards a 'new Materialism' through the Arts*. London: Tauris, 2013.
Bartky, Sandra Lee. “Toward a phenomenology of feminist consciousness.” *Social theory and Practice*, Fall 1975.
Bartky, Sandra Lee. *Femininity and domination: Studies in the phenomenology of oppression*. London: Psychology Press, 1990.
Benenti, Giuliano, Giulio Casati, and Giuliano Strini. *Principles of Quantum Computation and Information*. Vol. 1. London: World Scientific, 2004. Print.
Bennett, Jane. *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press, 2010. Print.
Bérubé, Michael and Cary Nelson. *Higher Education Under Fire: Politics, Economics, and the Crisis of the Humanities*. London: Psychology Press, 1995. Print.
Binning, G. and Rohrer H. “Scanning Tunneling Microscopy.” *IBM Journal of Research and Development* 2nd ser. 44.1 (2000): 279-93. Web.
Birke, Lynda, Mette Bryld, and Nina Lykke. “Animal Performances An Exploration of Intersections between Feminist Science Studies and Studies of Human/Animal Relationships.” *Feminist Theory* 5.2 (2004): 167-83. Web.
Bitbol, Michel. *Schrödinger’s Philosophy of Quantum Mechanics*. Dordrecht: Kluwer Academic Publishers, 2012. Print.
Black, Max. *Models and Metaphors*. Ithaca: Cornell University Press, 1962. Print.
Bleier, Ruth. *Feminist Approaches to Science. The Athene Series*. Pergamon Press, 1986.
Bogue, Ronald. *Deleuze and Guattari*. London: Routledge, 2005. Print.
Bogue, Ronald. *Deleuze on Literature*. New York: Routledge, 2003. Print.
Bogue, Ronald. *Deleuze on Music, Painting and the Arts*. New York: Routledge, 2003. Print.
Bogue, Ronald. *Deleuze's Way: Essays in Transverse Ethics and Aesthetics*. Burlington: Ashgate, 2007. Print.
Bohr, Niels. “On the Notions of Causality and Complementary.” *Science, New Series* 111.2873 (1950): 51-54. Web.
Bohr, Niels. *The Philosophical Writings of Niels Bohr*. Vol. 2. Woodbridge: Ox Bow, 1987. Print.
Bojowald, Martin. *The Universe: A View from Classical and Quantum Gravity*. Weinheim, Germany: Wiley-VCH, 2013. Print.
Bordo, Susan. *Unbearable Weight: Feminism, Western Culture, and the Body*. Berkeley: University of California Press: 1993.
Bordo, Susan. “The Cartesian Masculinization of Thought.” *Signs* 11 (Spring 1986): 439-456.
Born, Max, and Albert Einstein. *The Born Einstein Letters: Correspondence between Albert Einstein and Max and Hedwig Born from 1916 to 1955 with Commentaries by Max Born. Translated by Irene Born*. Trans. Irene Born. London: Macmillan, 1971. Print.
Bové, Paul A. “The Foucault Phenomenon: The Problematics of Style.” Foreword. *Foucault*. By Gilles Deleuze. Minneapolis: University of Minnesota Press, 1988. xii-xl. Print.

Bozalek, Vivenne, and Michalinos Zembylas. "Diffraction or Reflection? Sketching the Contours of Two Methodologies in Educational Research." *Nternational Journal of Qualitative Studies in Education* 30.2 (2017): 111-27. Web.
Braidotti, Rosi. *The Posthuman*. Oxford: Polity, 2013. Print.
Braidotti, Rosi. *Nomadic Subjects Embodiment and Sexual Difference in Contemporary Feminist Theory*. New York: Columbia University Press, 2011. Print.
Braidotti, Rosi. *Transpositions on Nomadic Ethics*. Cambridge: Polity, 2012. Print.
Bray, Joe, Alison Gibbons, and Brian McHale, eds. *The Routledge Companion to Experimental Literature*. London: Routledge, 2012. Print.
Briggs, Sheila. "What Is Feminist Theology?" *The Oxford Handbook of Feminist Theology*. Ed. Mary McClintock Fulkerson and Sheila Briggs. Oxford: Oxford University Press, 2013. 73-106. Print.
Brophy, Jessica E. "Developing a Corporeal Cyberfeminism: Beyond Cyberutopia." *New Media & Society* 12.6 (2010): 929-45. Web.
Bryant, Levi, Nick Srnicek, and Graham Harman. *The Speculative Turn: Continental Materialism and Realism*. Victoria: Re.press, 2011. Print.
Bryant, Levi R. *The Democracy of Objects*. Ann Arbor: Open Humanities, 2011. Print.
Buchanan, Ian, and John Marks, eds. *Deleuze and Literature*. Edinburgh: Edinburgh University Press, 2006. Print.
Buchanan, Ian. *A Deleuzian Century?* Durham: Duke University Press, 1999. Print.
Buchanan, Ian. *Deleuze and the Contemporary World*. Edinburgh: Edinburgh University Press, 2006.
Bühlmann, Vera, Felicity Colman, and Iris van der Tuin. "Introduction to New Materialist Genealogies: New Materialisms, Novel Mentalities, Quantum Literacy." *Minnesota Review* 88.1 (2018): 47-58.
Bunz, Mercedes. "Facing Our New Monster: On Critique in the Era of Affirmation." Paper presented," Terra Critica: Re-visioning the Critical Task of the Humanities in a Globalized World," Urecht University, Utrecht. December 2012.
Bürger, Christa. "The Reality of Machines: Notes on the Rhizome-thinking of Deleuze and Guattari." *Deleuze and Guattari*. Ed. Gary Genosko. London: Routledge, 2001. 1251-262. Print.
Butler, Judith. *Gender trouble: Feminism and the subversion of identity*. New York: Routledge, 1990.
Butler, Judith. *Bodies that matter: On the discursive limits of sex*. New York: Routledge, 1993.
Butler, Judith. "Ordinary, Incredulous," in Brooks, Peter, and Hilary Jewett, eds. *The humanities and public life*. Oxford: Oxford University Press, 2014.
Cachel, Susan. "Partisan primatology. Review of *Primate Visions: gender race and nature in the world of modern science*." *American Journal of Primatology* 22:139-142 (1990).
Cartmill, Matt. "Book Review: Primate Visions: gender race and nature in the world of modern science." *International Journal of Primatology*, Vol. 12, No. 1, 1991.
Chiew, Florence. "Posthuman Ethics with Cary Wolfe and Karen Barad: Animal Compassion as Trans-species Entanglement." *Theory, Culture & Society* 31.4 (2014): 51-69. Web.
Chodorow, Nancy. *Feminism and Psychoanalytic Theory*. New Haven: Yale University Press, 1989.
Christian, Von Baeyer Hans. *QBism: The Future of Quantum Physics*. Cambridge: Harvard University Press, 2016. Print.

Cixous, Hélène, and Catherine Clément. *The Newly Born Woman*. Trans. Betsy Wing. Minneapolis: University of Minnesota Press, 2001. Print.
Cixous, Hélène. "The Laugh of the Medusa." Trans. Keith Cohen and Paula Cohen. *Signs: Journal of Women in Culture and Society* 1.4 (1976): 875-93. Web.
Clough, Patricia Ticineto, and Jean O'Malley Halley, eds. *The Affective Turn: Theorizing the Social*. Durham: Duke University Press, 2007. Print.
Code, Lorraine. *What can she know? Feminist theory and the construction of knowledge*. Ithaca: Cornell University Press, 1991.
Colebrook, Claire, and Ian Buchanan, eds. *Deleuze and Feminist Theory*. Edinburgh: Edinburgh University Press, 2000. Print.
Coleman, Rebecca. *The Becoming of Bodies: Girls, Images, Experience*. Manchester: Manchester University Press, 2012. Print.
Collins, Patricia Hill. *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment*. New York: Routledge, 1990. Print.
Colman, Felicity. *Deleuze and Cinema: The Film Concepts*. Oxford: Berg, 2011. Print.
Connolly, William E. *The Fragility of Things Self-organizing Processes, Neoliberal Fantasies, and Democratic Activism*. Durham: Duke University Press, 2013. Print.
Coole, Diana H., and Samantha Frost, eds. *New Materialisms: Ontology, Agency, and Politics*. Durham: Duke University Press, 2010. Print.
Coole, Samantha. "Agentic Capacities and Capacious Historical Materialism: Thinking with New Materialisms in the Political Sciences." *Millennium-Journal of International Studies* 41.3 (2013): 451-69. Web.
Coole, Samantha. "From Within the Midst of Things." *Realism Materialism Art.* Eds. Christoph Cox, Jenny Jaskey, and Jaskey Malik. Berlin: Sternberg, 2014. 41-46. Print.
Course, Magnus. "The Birth of the Word: Language, Force, and Mapuche Ritual Authority." *HAU: Journal of Ethnographic Theory* 2.1 (2012): 1-26. Web.
Cox, Brian, and J. R. Forshaw. *The Quantum Universe: (and Why Anything That Can Happen, Does)*. Boston: Da Capo, 2013. Print.
Crenshaw, Kimberle. *On Intersectionality: Essential Writings*. London: New Press, 2016. Print.
Cusset, François. *French Theory: How Foucault, Derrida, Deleuze, & Co. Transformed the Intellectual Life of the United States*. Trans. Jeff Fort. Minneapolis: University of Minnesota Press, 2008. Print.
Daston, Lorraine, and Peter Galison. *Objectivity*. New York: Zone Books, 2010. Print.
Davis, Colin. *Critical Excess: Overreading in Derrida, Deleuze, Levinas, ZÌŒizÌŒek and Cavell*. Stanford, CA: Stanford University Press, 2010. Print.
Davis, Nick. *The Desiring-image Gilles Deleuze and Contemporary Queer Cinema*. New York: Oxford University Press, 2013. Print.
Davisson, C. J., and L. Hj Germer. "Reflection of Electrons by a Crystal of Nickel." *Proceedings of the National Academy of Sciences USA* 14.4 (1928): 317-22. Web.
De Beauvoir, Simone. *The Second Sex*. Trans. HM Parshley. Reprint. New York: Vintage Books (1952).
Deleuze, Gilles, and Claire Parnet. *Dialogues*. Paris: Flammarion, 2008. Print.
Deleuze, Gilles, and Félix Guattari. *Anti-Oedipus: Capitalism and Schizophrenia*. Trans. Robert Hurley, Mark Seem, and Helen R. Lane. Vol. 1. London: Continuum, 1977. Print.
Deleuze, Gilles, and Félix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia*. Trans. Brian Massumi. Minneapolis: University of Minnesota Press, 1987. Print.

Deleuze, Gilles, and Félix Guattari. *What Is Philosophy?* Trans. Hugh Tomlinson and Graham Burchell. New York: Columbia University Press, 1994. Print.
Deleuze, Gilles, and Félix Guattari. *Kafka: Toward a Minor Literature*. Trans. Dana Polan. Minneapolis: University of Minnesota, 1986. Print.
Deleuze, Gilles, and Hugh Tomlinson. *Nietzsche and Philosophy*. New York: Columbia University Press, 1983. Print.
Deleuze, Gilles. *Cinema I: The Movement-image*. Trans. Hugh Tomlinson and Barbara Habberjam. London: Continuum, 1986. Print.
Deleuze, Gilles. *Desert Islands and Other Texts: 1953-1974*. Ed. David Lapoujade. Trans. Michael Taormina. Los Angeles: Semiotext(e), 2004. Print.
Deleuze, Gilles. *Difference and Repetition*. Trans. Paul Patton. London: Bloomsbury, 2014. Print.
Deleuze, Gilles. *Foucault*. Trans. Seán Hand. London: Continuum, 1999.
Deleuze, Gilles. *Francis Bacon: The Logic of Sensation*. Trans. Daniel W. Smith. London: Continuum, 2003. Print.
Deleuze, Gilles. "Interview with Catherine Clément." Interview by Catherine Clement. *L'arc* 1980: 94-99. Print.
Deleuze, Gilles. "'A Life of Pure Immanence': Deleuze's 'Critique Et Clinique' Project." Introduction. *Gilles Deleuze Essays Critical and Clinical*. Trans. Michael A. Greco and Daniel W. Smith. Minneapolis: University of Minnesota, 1997. xi-lv. Print.
Deleuze, Gilles. *Masochism: Coldness and Cruelty*. New York: Zone, 1991. Print.
Deleuze, Gilles. *Negotiations: 1972-1990*. Trans. Martin Joughin. New York: Columbia University Press, 1997. Print.
Deleuze, Gilles. *Proust And Signs The Complete Text*. Trans. Richard Howard. Minneapolis: University of Minnesota Press, 2014. Print.
Deleuze, Gilles. *Spinoza: Practical Philosophy*. Trans. Robert Hurley. San Francisco: City Lights, 2007. Print.
Derrida, Jacques. *Positions*. Trans. Alan Bass. London: Continuum, 2004. Print.
Deutscher, Penelope. *Yielding Gender: Feminism, Deconstruction, and the History of Philosophy*. London: Routledge, 2002. Print.
Deuze, Mark. *Media Life*. Cambridge: Polity, 2012. Print.
Dickson, Michael. "The EPR Experiment: A Prelude to Bohr's Reply to EPR." *History of Philosophy of Science* (2002): 263-75. Web.
Dirac, Paul Adrien Maurice. *The Principles of Quantum Mechanics: 4th Ed*. Oxford: Clarendon, 1967. Print.
Dixon-Román, Ezekiel J. "Diffractive Possibilities: Cultural Studies and Quantification." *Transforming Anthropology* 24.2 (2016): 157-67. Web.
Dolling, Lisa M. "Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning." Rev. of *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. *Hypatia* 24.1 (2009): 212-218. Web.
Dolphijn, Rick, and Iris Van der Tuin. *New Materialism: Interviews & Cartographies*. Ann Arbor: Open Humanities, 2012. Print.
Dosse, François. *Gilles Deleuze and Felix Guattari: Intersecting Lives*. New York: Columbia University Press, 2011. Print.
Dowd, Garin. *Abstract Machines: Samuel Beckett and Philosophy after Deleuze and Guattari*. Amsterdam: Rodopi, 2007. Print.

Doyle, Richard. *Darwin's Pharmacy: Sex, Plants, and the Evolution of the Noösphere*. Seattle: University of Washington Press, 2011. Print.
Dürr, Detlef, Sheldon Goldstein, and Nino Zanghì. *Quantum Physics without Quantum Philosophy*. New York: Springer, 2013. Print.
Edmond, Jacob. "Diffracted Waves and World Literature." *Parallax* 20.3 (2014): 245-57. Web.
Eigler, Don. "From the Bottom Up: Building Things with Atoms." *Nanotechnology*. Ed. Gregory L. Timp. New York: AIP/Springer, 1999. 425-36. Print.
Einstein, Albert, Boris Podolsky, and Nathan Rosen. "Can Quantum-mechanical Description of Reality Be Considered Complete?" *Physics Review* 47 (1935). Web.
Evans, James, and A. S. Thorndike. *Quantum Mechanics at the Crossroads: New Perspectives from History, Philosophy and Physics*. Berlin: Springer, 2007. Print.
Fausto-Sterling, Anne. *Myths of Gender: Biological Theories about Women and Men; Includes a New Chapter on Brain Anatomy, Sex Differences, and Homosexuality*. New York: Basic Books, 1996. Print.
Fausto-Sterling, Anne. *Sexing the Body: Gender Politics and the Construction of Sexuality*. New York: Basic Books, 2000.
Fausto-Sterling, Anne. *Sex/gender: Biology in a Social World*. New York: Routledge, 2012. Print.
Faye, Jan, and Henry J. Folse, eds. *Niels Bohr and Contemporary Philosophy*. Dordrecht: Springer, 2011. Print.
Fenwick, Tara J., and Richard Edwards. *Actor-network Theory in Education: A Focus on Educational Change*. Oxford: Blackwell, 2011. Print.
Ferguson, Margaret W., and Jennifer Wicke, eds. *Feminism and Postmodernism*. Durham: Duke University Press, 1994. Print.
Feynman, Richard P., Robert B. Leighton, and Matthew Sands. *The Feynmann Lectures on Physics*. Vol. 1. New York: Basic Books, 2010. Print.
Fine, Arthur, and Mara Beller. "Bohr's Response to EPR." *Niels Bohr and Contemporary Philosophy*. Netherlands: Springer, 1994. 1-31. Print.
Fine, Arthur. *The Shaky Game: Einstein, Realism, and the Quantum Theory*. Chicago: University of Chicago Press, 1997. Print.
Flax, Jane. "Political philosophy and the patriarchal unconscious: A psychoanalytic perspective on epistemology and metaphysics," in Sandra Harding and Merrill B. Hintikka, eds. *Discovering reality*. D. Reidel Publishing Company, 1983. 245-281.
Flaxman, Gregory. *The Brain Is the Screen: Deleuze and the Philosophy of Cinema*. Minneapolis: University of Minnesota Press, 2000. Print.
Foucault, Michel. *The Archeology of Knowledge and the Discourse on Language*, Translated by A.M. Sheridan Smith. New York: Pantheon Books, [1969] 1972.
Foucault, Michel. *Discipline and Punish: The Birth of the Prison*. Trans. Alan Sheridan. London: Penguin, 1977. Print.
Foucault, Michel. "What Is Critique?" *The Politics of Truth*. Ed. Sylvère Lotringer. Trans. Lysa Hochroth. Los Angeles: Semiotext(e), 2007. Print.
Frank, Søren. *Salman Rushdie: A Deleuzian Reading*. Kobenhavn: Museum Tusculanum, 2011. Print.
Freudenthal, Gideon. *Atom and Individual in the Age of Newton: On the Genesis of the Mechanistic World View*. Dordrecht: Springer, 2013. Print.
Frichot, Hélène, Catharina Gabrielsson, and Jonathan Metzger, eds. *Deleuze and the City*.

Edinburgh: Edinburgh University Press, 2016. Print.
Friedrich, Bretislav, and Dudley Herschbach. "Stern and Gerlach: How a Bad Cigar Helped Reorient Atomic Physics." *Physics Today* 56.12 (2003): 53-59. Web.
Fuchs, Christopher. "A Private View of Quantum Reality." Interview by Amanda Gefter. *Wired Magazine* 14 June 2015. Web.
Fuchs, Christopher. "Q2: Interview with Professor Christopher Fuchs." Interview. *Project Q: Peace and Security in a Quantum Age*. University of Sydney, n.d. Web.
Gardner, Colin, and Patricia MacCormack, eds. *Deleuze and the Animal*. Edinburgh: Edinburgh University Press, 2017. Print.
Gilbert, Sandra M., and Susan Gubar. *The Madwoman in the Attic: The Woman Writer and the Nineteenth-century Literary Imagination*. New Haven: Yale University Press, 1979. Print.
Gillen, Julia. *Digital Literacies*. Abingdon, Oxon: Routledge, 2014. Print.
Gillis, Stacy, and Rebecca Munford. "Genealogies and Generations: The Politics and Praxis of Third Wave Feminism." *Women's History Review* 13.2 (2004): 165-82. Web.
Gillis, Stacy, Gillian Howie, and Rebecca Munford, eds. *Third Wave Feminism: A Critical Exploration*. Basingstoke: Palgrave Macmillan, 2004. Print.
Golovchenko, J. A. "Tunneling Microscopy." Ed. F. W. De Wette. *Solvay Conference on Surface Science: Invited Lectures and Discussions, University of Texas, Austin, TX, Dec. 14-18, 1987*. Berlin: Springer-Verlag, 1988. 198-215. Print.
Gorgias. *Encomium of Helen*. Trans. Mac Dowell D. M. Bristol: Bristol Classical, 2005. Print.
Grib, Andrej Anatoljevich, and Waldyr Alves Rodrigues, Jr. *Nonlocality in Quantum Physics*. New York: Springer, 1999. Print.
Grosz, Elizabeth A. *Volatile Bodies: Toward a Corporeal Feminism*. Bloomington: Indiana University Press, 1994. Print.
Grosz, Elizabeth A. *The Nick of Time: Politics, Evolution, and the Untimely*. Durham: Duke University Press, 2004. Print.
Grosz, Elizabeth A. *Time Travels: Feminism, Nature, Power*. Durham: Duke University Press, 2005. Print.
Grosz, Elizabeth. *Becoming Undone: Darwinian Reflections on Life, Politics, and Art*. Durham: Duke University Press, 2011. Print.
Gutting, Gary. "Science Humanities Gap." *New York Times*, 18 Sept. 2013. Web.
Hacking, Ian. "Experimentation and Scientific Realism." *Philosophical Topics* 13 (1982): 71-87. Web.
Hacking, Ian. *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science*. Cambridge: Cambridge University Press, 2010. Print.
Hacking, Ian. *The Social Construction of What?* Cambridge: Harvard University Press, 1999. Print.
Halmos, Paul R. "Von Neumann on Measure and Ergodic Theory." *Bulletin of the American Mathematical Society* 64 (1958): n. pag. Web.
Hamner, M. Gail. "The Work of Love: Feminist Politics and the Injunction to Love." *Opting for the Margins: Postmodernity and Liberation in Christian Theology* 9 (2003).
Hansma, Paul K., and Jerry Tersoff. "Scanning Tunneling Microscopy." *Journal of Applied Physics* 61.2 (1987): R1-R24. Web.
Haraway, Donna. "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective." *Feminist Studies*, Vol 14 (Autumn 1988): 575-599.

Haraway, Donna Jeanne. *Primate visions: Gender, race, and nature in the world of modern science*. London: Psychology Press, 1989.
Haraway, Donna. "Reading Buchi Emecheta: Contests for Women's Experience in Women's Studies." *Women: A Cultural Review* 1.3, 1990: 240-55. Web.
Haraway, Donna Jeanne. *Simians, Cyborgs, and Women: The Reinvention of Nature*. London: Free Association, 1991. Print.
Haraway, Donna Jeanne. "The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others." *Cultural Studies*. Ed. Lawrence Grossberg, Cary Nelson, and Paula A. Treichler. New York: Routledge, 1992. 295-337. Print.
Haraway, Donna. "A Game of Cat's Cradle: Science Studies, Feminist Theory, Cultural Studies." *Configurations: A Journal of Literature and Science*. 1994: 59-71.
Haraway, Donna J. *Modest_Witness@Second_Millennium. FemaleMan©_Meets_OncoMouse™ Feminism and Technoscience*. New York: Routledge, 1997. Print.
Harding, Sandra G. *The science question in feminism*. Ithaca: Cornell University Press, 1986.
Harding, Sandra G., ed. *Feminism and methodology: Social science issues*. Bloomington: Indiana University Press, 1987.
Harding, Sandra G. *Whose Science? Whose Knowledge?: Thinking from Women's Lives*. Ithaca: Cornell University Press, 1991. Print.
Harding, Sandra G. *Is science multicultural?: Postcolonialisms, feminisms, and epistemologies*. Bloomington: Indiana University Press, 1998.
Harding, Sandra G. *Science and Social Inequality: Feminist and Postcolonial Issues*. Champaign: University of Illinois Press, 2006. Print.
Harman, Graham. *Prince of Networks: Bruno Latour and Metaphysics*. Victoria: Re. press, 2010.
Haroche, S., and J.-M Raimond. *Exploring the Quantum: Atoms, Cavities, and Photons*. Oxford: Oxford University Press, 2013. Print.
Hartsock, Nancy. *The Feminist Standpoint Revisited and Other Essays*. Boulder: Westview Press, 1998
Haven, Emmanuel, and Andrei Khrennikov. *Quantum Social Science*. Cambridge: Cambridge University Press, 2013. Print.
Hekman, Susan. "Beyond Identity: Feminism, Identity and Identity Politics." *Feminist Theory* 1.3 (2000): 289-308. Web.
Hekman, Susan. "Constructing the Ballast: An Ontology for Feminism." *Material Feminisms*. Ed. Stacy Alaimo and Susan Hekman. Bloomington: Indiana University Press, 2009. Print.
Hekman, Susan J. *The Material of Knowledge: Feminist Disclosures*. Bloomington: Indiana University Press, 2010. Print.
Hemmings, Clare. "Telling Feminist Stories," *Feminist Theory* 6 (2005): 115-139.
Hemmings, Clare. *Why Stories Matter: The Political Grammar of Feminist Theory*. Durham: Duke University Press, 2011. Print.
Hennessy, Rosemary. *Materialist Feminism and the Politics of Discourse*. London: Routledge, 1993. Print
Henry, Astrid. *Not My Mother's Sister: Generational Conflict and Third-wave Feminism*. Bloomington: Indiana University Press, 2004. Print.
Herodotus. *Herodotus: Histories*. Trans. Michael A. Flower and John Marincola. Cambridge: Cambridge University Press, 2002. Print.
Hickey Moody, Anna, and Tara Page. *Arts, pedagogy and cultural resistance: New materialisms*.

New York: Rowman & Littlefield International, 2015.
Hinton, Peta, and Iris Van Der Tuin. "Special Issue: Feminist Matters: The Politics of New Materialism." *Women: A Cultural Review* 25.1 (2014): 1-8. Web.
Hinton, Peta, Michael O'Rourke, and Karen Sellberg, eds. "Diffracted Worlds, Diffractive Reading: Onto-Epistemologies and the Critical Humanities, Special Issue." *Parallax* 20.3 (2014): n. pag. Web.
Hinton, Peta. "The Quantum Dance and the World's 'extraordinary Liveliness': Refiguring Corporeal Ethics in Karen Barad's Agential Realism." *Somatechnics* 3.1 (2013): 169-89. Web.
Hird, Myra J. "Review: Feminist Engagements with Matter: Judith Butler: Live Theory by Vicki Kirby." *Feminist Studies* 35.2 (2009): 329-46. Web.
Hird, Myra J. "Feminist Matters: New Materialist Considerations of Sexual Difference." *Feminist Theory* 5.2 (2004): 223-32. Web.
Højgaard, Lis, and Dorte Marie Søndergaard. "Theorizing the Complexities of Discursive and Material Subjectivity: Agential Realism and Poststructural Analyses." *Theory & Psychology* 21.3 (2011): 338-54. Web.
Home, Dipankar, and Andrew Whitaker. *Einstein's Struggles with Quantum Theory: A Reappraisal*. New York, NY: Springer, 2007. Print.
Homer. *The Iliad of Homer*. Trans. Richmond Lattimore. Chicago: University of Chicago, 1951. Print.
Howie, Gillian. *Between Feminism and Materialism: A Question of Method*. London: Palgrave Macmillan, 2010. Print.
Hughes, John. *Lines of Flight: Reading Deleuze with Hardy, Gissing, Conrad, Woolf*. Sheffield: Sheffield Academic Press, 1997.
Ingold, Tim. *Making: Anthropology, Archeology, Art and Architecture*. New York: Routledge, 2013. Print.
Irigaray, Luce, and Gillian C. Gill. *An Ethics of Sexual Difference*. Trans. Carolyn Burke. Ithaca: Cornell University Press, 1993. Print.
Irigaray, Luce. *The Sex Which Is Not One*. Trans. Catherine Porter. Ithaca: Cornell University Press, 1985. Print.
Irigaray, Luce. *Speculum of the Other Woman*. Ithaca: Cornell University Press, 2010. Print.
Isaacson, Walter. "The Intersection of the Humanities and the Sciences." Jefferson Lecture in the Humanities. John F. Kennedy Center for the Performing Arts, Washington DC. May 2017. *National Endowment for the Humanities*. Web. 12 May 2017.
Jagger, Gill. "The New Materialism and Sexual Difference." *Signs: Journal of Women in Culture and Society* 40.2 (2015): 321-42. Web.
Jardine, Alice A. *Gynesis: Configurations of Women and Modernity*. Ithaca: Cornell University Press, 1986. Print.
Jones, Liz, and Rachel Holmes. "Flickering, Spilling and Diffusing Body/knowledge in the Posthuman Early Years." *Posthuman Research Practices in Education*. Ed. Carol A. Taylor and Christina Hughes. London: Palgrave Macmillan UK, 2016. 108-27. Print.
Kaiser, Birgit, and Kathrin Thiele, eds. "Diffraction: Onto-epistemology, Quantum Physics and the Critical Humanities." *Parallax* 20.3 (2014). Web.
Kaiser, Birgit Mara, and Kathrin Thiele. "Other Headings: Ben Jelloun, Derrida, Sansal and the Critique of Europe." *Interventions* 18.2 (2016): 270-85. Web.
Kaiser, Birgit Mara. "Worlding CompLit: Diffractive Reading with Barad, Glissant and Nancy."

*Parallax* 20.3 (2014): 274-87. Web.
Kaufman, Eleanor, and Kevin Jon Heller, eds. *Deleuze & Guattari: New Mappings in Politics, Philosophy, and Culture*. Minneapolis: University of Minnesota, 1998. Print.
Keller, Evelyn Fox, and David A. Hollinger. *Reflections on Gender and Science*. New Haven: Yale University Press, 1995. Print.
Kember, Sarah, and Joanna Zylinska. *Life after New Media: Mediation as a Vital Process*. Cambridge: MIT Press, 2015. Print.
Kirby, Vicki. *Judith Butler: Live Theory*. London: Continuum, 2007. Print.
Kirby, Vicki. *Quantum Anthropologies: Life at Large*. Durham and London: Duke University Press, 2011. Print.
Kuhn, Thomas S. *The Essential Tension: Selected Studies in Scientific Tradition and Change*. Chicago: University of Chicago Press, 2000. Print.
Kumar, Manjit. *Quantum: Einstein, Bohr, and the Great Debate about the Nature of Reality*. New York: W.W. Norton, 2009. Print.
Lambert, Gregg. *Who's Afraid of Deleuze and Guattari*. London: Continuum, 2008. Print.
Landé, Alfred. *New Foundations of Quantum Mechanics*. Cambridge: Cambridge University Press, 2015. Print.
Lapoujade, David. *Aberrant Movements: The Philosophy of Gilles Deleuze*. Los Angeles: Semiotexte/Smart Art, 2017.
Lather, Patricia. *Engaging Science Policy: From the Side of the Messy*. New York: Peter Lang, 2010. Print.
Lather, Patti. "Becoming Feminist" An Untimely Meditation on Football." *Cultural Studies? Critical Methodologies* 12.4 (2012): 357-60. Web.
Latour, Bruno, and Steve Woolgar. *Laboratory Life: The Construction of Scientific Facts*. Princeton: Princeton University Press, 2006. Print.
Latour, Bruno. "Has Critique Run out of Steam? from Matters of Fact to Matters of Concern." *Critical Inquiry* 30.2 (2004): 225-48. Web.
Latour, Bruno. *On the Modern Cult of the Factish Gods*. Durham: Duke University Press, 2011. Print.
Latour, Bruno. *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press, 2005. Print.
Latour, Bruno. *What Is the Style of Matters of Concern?: Two Lectures in Empirical Philosophy*. Assen: Koninklijke Van Gorcum, 2008. Print.
Leghtas, Zaki. "Preparing Schrodinger Cat States by Parametric Pumping." *APS Meeting Abstracts* 1 (2014): n. pag. Web.
Lloyd, Genevieve. *The Man of Reason: "male" and "female" in Western philosophy*. Methuen & Co. Ltd. 1986.
Longino, Helen E. *Science as social knowledge: Values and objectivity in scientific inquiry*. Princeton: Princeton University Press, 1990.
Lynch, Michael, and Steve Woolgar. *Representation in Scientific Practice*. Cambridge, Mass: MIT Press, 1990. Print.
MacKinlay, Elizabeth. "A Diffractive Narrative About Dancing Towards Decoloniality in an Indigenous Australian Studies Performance Classroom." *Engaging First Peoples in Arts-Based Service Learning* (2016): 213-26. Web.
Marenko, Betti, and Jamie Brassett, eds. *Deleuze and Design*. Edinburgh: Edinburgh University Press, 2015. Print.

Marshall, Yvonne, and Benjamin Alberti. "A Matter of Difference: Karen Barad, Ontology and Archaeological Bodies." *Cambridge Archaeological Journal* 24.01 (2014): 19-36. Web.
Martin, Emily. "The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-female Roles." *Signs: Journal of Women in Culture and Society* 16.3 (1991): 485-501. Web.
Massumi, Brian. *Parables for the Virtual: Movement, Affect, Sensation*. Durham: Duke University Press, 2002. Print.
Mazzei, Lisa. "Beyond an Easy Sense: A Diffractive Analysis." *Qualitative Inquiry* 20.6 (2014): 742-46. Web.
Mazzei, Lisa. "Materialist Mappings of Knowing in Being: Researchers Constituted in the Production of Knowledge." *Gender and Education* 25.6 (2013): 776-85. Web.
McEvoy, Paul. *Niels Bohr: Reflections on Subject and Object*. San Francisco: Microanalytix, 2001. Print.
McNeil, Maureen. "Post- Millennial Feminist Theory: Encounters with Humanism, Materialism, Critique, Nature, Biology and Darwin." *Journal for Cultural Research* 14.4 (2010): 427-37. Web.
Meillassoux, Quentin. *After finitude: An essay on the necessity of contingency*. New York: Bloomsbury Publishing, 2010. Print.
Merleau-Ponty, Maurice. *Phenomenology of Perception*. Trans. Colin Smith. London: Routledge 1962. Print.
Mermin, N. David. "What's wrong with this pillow?" *Physics Today* (April 1989, Vol. 42, Issue 4). Web.
Mermin, N. David. "Could Feynman have said this?" *Physics Today* (May 2004, Vol. 57, Issue 5). Web.
Moi, Toril. *Sexual/Textual Politics: Feminist Literary Theory*. London: Routledge, 1985. Print.
Moi, Toril. *What is a Woman? And other essays*. Oxford: Oxford University Press, 1999.
Mol, Annemarie, and John Law. *Complexities: Social Studies of Knowledge Practices*. Durham: Duke University Press, 2002.
Moran Nocek, Stacey. "Dangerously Small Things': Response to Iris Van Der Tuin." *Australian Feminist Studies* 31.89 (2016): 267-75. Web.
Moran, Richard. "Artifice and Persuasion: The Work of Metaphor in the 'Rhetoric'." *Essays in Aristotle's Rhetoric*. Ed. Amélie O. Rorty. Berkeley: University of California Press, 1996. 385-98. Print.
Murris, Karin. *The Posthuman Child: Educational Transformation through Philosophy with Picturebooks*. London: Routledge, 2016. Print.
Nelson, Lynn Hankinson. "Epistemological communities." *Feminist epistemologies*. Ed. Linda Alcoff and Elizabeth Potter. London: Routledge (1993): 121-160.
Nelson, Lynn Hankinson. "A Question of Evidence." *Hypatia* 8.2. (1993): 172-189.
Nelson, Lynn Hankinson. "The very idea of feminist epistemology." *Hypatia* 10.3 (1995): 31-49.
Nelson, Lynne Hankinson, and Alison Wylie. "Introduction: Hypatia Special Issue on Feminist Science Studies." *Hypatia* 19.1 (2004): Vii-Xii. Web.
Nelson, Lynn Hankinson. *Who Knows: From Quine to a Feminist Empiricism*. Philadelphia: Temple University Press 2010. Print.
Nussbaum, Martha. *Not For Profit: Why democracy needs the humanities*. Princeton: Princeton University Press, 2016.
Newton, Isaac. *The Principia: Mathematical Principles of Natural Philosophy*. Trans. I. Bernard

Cohen, Anne Miller Whitman, and Julia Budenz. Oakland: University of California, 2016. Print.
Ney, Alyssa, and David Z. Albert. *The Wave Function: Essays on the Metaphysics of Quantum Mechanics*. Oxford: Oxford University Press, 2013. Print.
Nietzsche, Friedrich Wilhelm. *On the Genealogy of Morals: A Polemic: By Way of Clarification and Supplement to My Last Book, Beyond Good and Evil*. Trans. Douglas Smith. Oxford: Oxford University Press, 2008. Print.
Nigianni, Chrysanthi. *Deleuze and Queer Theory*. Edinburgh: Edinburgh University Press, 2010. Print.
Olkowski, Dorothea. "The Cogito and the Limits of Neo-materialism and Naturalized Objectivity." *Rhizomes: Cultural Studies in Emerging Knowledge* 30 (2016): n. pag. Web.
Olsen, Bjornar, Michael Shanks, Timothy Webmoor, and Christopher Witmore. *Archaeology: The Discipline of Things*. Berkeley: University of California Press, 2012. Print.
Pauling, Linus, and Edgar Bright Wilson. *Introduction to Quantum Mechanics: With Applications to Chemistry*. New York: Dover, 2011. Print.
Pfeifer, Geoff. *The New Materialism Althusser, Badiou, and Žižek*. Florence: Taylor and Francis, 2015. Print.
Pickering, Andrew. *Constructing Quarks: A Sociological History of Particle Physics*. Chicago: University of Chicago Press, 1999.
Pickering, Andrew. *Science As Practice and Culture*. Chicago: University of Chicago Press, 1992. Print.
Pickering, Andrew. *The Mangle of Practice: Time, Agency, and Science*. Chicago: University of Chicago Press, 2010. Print.
Pignarre, Phillippe, and Isabelle Stengers. *Capitalist Sorcery: Breaking the Spell*. London: Palgrave Macmillan, 2012. Print.
Pinch, Trevor. "Karen Barad, quantum mechanics, and the paradox of quantum inclusivity." *Social Studies of Science*. 41(3); 431-441. (2011). Web.
Pinker, Steven. "Science Is Not Your Enemy." *New Republic*. Aug. 2013. Web.
Pisters, Patricia. *The Matrix of Visual Culture: Working with Deleuze in Film Theory*. Stanford: Stanford University Press, 2003. Print.
Plato. *Gorgias, Menexenus, Protagoras*. Trans. Malcolm Schofield and Tom Griffith. Cambridge: Cambridge University Press, 2010. Print.
Plato. *Phaedrus*. Trans. Alexander Nehemas and Paul Woodruff. Indianapolis: Hackett, 1995. Print.
Plotnitsky, Arkady. *Complementarity: Anti-Epistemology after Bohr and Derrida*. Durham: Duke University Press, 1994. Print.
Plotnitsky, Arkady. *The Principles of Quantum Theory, from Planck's Quanta to the Higgs Boson: The Nature of Quantum Reality and the Spirit of Copenhagen*. Switzerland: Springer, 2016. Print.
Plutarch. *Plutarch's Lives in Eight Volumes*. Trans. John Dryden. London: Printed for J. and R. Tonson and S. Draper, 1749. Print.
Puar, Jasbir. "'I'd Rather Be a Cyborg than a Goddess': Becoming Intersectional in Assemblage Theory." *Literary Theory: An Anthology*. Ed. Julie Rivkin and Michael Ryan. Winchester, West Sussex: John Wiley & Sons, 2017. 1000-1013. Print.
Rabinow, Paul, and Gaymon Bennett. *Designing Human Practices: An Experiment with*

*Synthetic Biology*. Chicago: University of Chicago Press, 2012. Print.
Rabinow, Paul, and Nikolas Rose. "Biopower Today." *BioSocieties* 1.2 (2006): 195-217. Web.
Rai, Amit S. *Untimely Bollywood: Globalization and India's new media assemblage*. Durham: Duke University Press, 2010. Print.
Rajchman, John. *The Deleuze Connections*. Cambridge: MIT Press, 2000. Print.
Ramey, Joshua Alan. *The Hermetic Deleuze: Philosophy and Spiritual Ordeal*. Durham: Duke University Press, 2012. Print.
Reger, Jo, ed. *Different Wavelengths Studies of the Contemporary Women's Movement*. London: Routledge, 2014. Print.
Rió, Elena Del. *Deleuze and the Cinemas of Performance: Powers of Affection*. Edinburgh: Edinburgh University Press, 2012. Print.
Ridgen, John S. *Einstein 1905: The Standard of Greatness*. Cambridge: Harvard University Press, 2005.
Rieger, Joerg, and Edward Waggoner, eds. *Religious Experience and New Materialism: Movement Matters*. Basingstoke, Hampshire: Palgrave Macmillan, 2016. Print.
Rigden, John S. *Einstein 1905: The Standard of Greatness*. Cambridge: Harvard University Press, 2006. Print.
Roosth, Sohia, and Astrid Schrader. "Feminist Theory out of Science: Introduction." *Differences* 23.3 (2012): 1-8. Web.
Rothman, Roger, and Ian Verstegen, eds. *The Art of the Real. Visual Studies and New Materialisms*. Newcastle upon Tyne: Cambridge Scholars, 2016. Print.
Rouse, Joseph. *Engaging Science: How to Understand Its Practices Philosophically*. Ithaca: Cornell University Press, 1996. Print.
Rouse, Joseph, "Understanding Scientific Practices: Cultural Studies of Science as a Philosophical Program" (1999). *Division I Faculty Publications. Paper 23*. Web.
Rouse, Joseph. "Standpoint Theories Reconsidered." *Hypatia* 24.4 (2009): 200-09. Web.
Rouse, Joseph. *How Scientific Practices Matter: Reclaiming Philosophical Naturalism*. Chicago: University of Chicago Press, 2003. Print.
Saldanha, Arun, and Hannah Stark, eds. *Deleuze and Guattari in the Anthropocene*. Edinburgh: Edinburgh University Press, 2016. Print.
Saldanha, Arun, and Jason Michael Adams. *Deleuze and Race*. Edinburgh: Edinburgh University Press, 2013. Print.
Sandilands, Catriona Mortimer. "Landscape, Memory and Forgetting: Thinking through (My Mother's) Body and Place." Ed. Susan Hekman. *Material Feminisms*. Ed. Stacy Alaimo. Bloomington: Indiana University Press, 2009. N. pag. Print.
Sauvagnargues, Anne. *Deleuze and Art*. Trans. Samantha Bankson. London: Bloomsbury, 2016. Print.
Schweber, Silvan S. "Karen Barad. Meeting the Universe Halfway: Quantum Physics and the Entanglement of Meaning and Matter." *Isis: Journal of History of Science in Society* 99.4 (2008): 879-82. Web.
Sehgal, Melanie. "Diffractive Propositions: Reading Alfred North Whitehead with Donna Haraway and Karen Barad." *Parallax* 20.3 (2014): 188-201. Web.
Sellberg, Karin, and Peta Hinton, eds. "Quantum Possibilities: The Work of Karen Barad, Special Issue." *Rhizomes* 30 (2016): n. pag. Web.
Shaviro, Steven. *Post-cinematic Affect*. Winchester: 0 Press, 2010. Print.
Shaviro, Steven. *The Universe of Things*. Minneapolis: University of Minnesota Press: 2014.

Print.
Sheldon, Rebekah. "Matter and Meaning." *Rhizomes: Cultural Studies in Emerging Knowledge* 30 (2016): n. pag. Web.
Showalter, Elaine. *A Literature of Their Own: From Charlotte Brontë to Doris Lessing*. London: Virago, 1982. Print.
Smelik, Anneke, and Nina Lykke, eds. *Bits of Life: Feminism at the Intersections of Media, Bioscience, and Technology*. Seattle: University of Washington Press, 2008. Print.
Smith, Daniel W. *Essays on Deleuze*. Edinburgh: Edinburgh University Press, 2012. Print.
Smith, Dorothy E. *The Conceptual Practices of Power a Feminist Sociology of Knowledge*. Toronto: University of Toronto Press, 1990. Print.
Smith, Dorothy E. "Comment on Hekman's" Truth and Method: Feminist Standpoint Theory Revisited." *Signs: Journal of Women in Culture and Society* 22.2 (1997): 392-398.
Spector, Karen. "Meeting Pedagogical Encounters Halfway." *Journal of Adolescent & Adult Literacy* 58.6 (2016): 447-50. Web.
Spiegel, Alix, and Lulu Miller. "Entanglement." *Invisiblia*. National Public Radio. 30 Jan. 2015. Radio.
Spiegel, Alix, and Lulu Miller. "Contagion + Maria Bamford." *Invisiblia*. National Public Radio. 30 Jan. 2015. Web.
Steinbach, Peter J. "Classical and Quantum Mechanics—in a Nutshell." Center for Molecular Modeling, 15 Nov. 2010. Web.
Stengers, Isabelle. "A Constructivist Reading of Process and Reality." *Theory, Culture & Society* 25.4 (2008): 91-110. Web.
Stengers, Isabelle. *Cosmopolitics II*. Minneapolis: University of Minnesota Press, 2011. Print.
Stengers, Isabelle. *Thinking with Whitehead: A Free and Wild Creation of Concepts*. Trans. Michael Chase. Cambridge: Harvard University Press, 2011. Print.
Stewart, Larry. "Seeing through the Scholium: Religion and Reading Newton in the Eighteenth Century." *History of Science* 34 (1996): 123-65. Web.
Stivale, Charles J. *Gilles Deleuze's ABCs The Folds of Friendship*. Baltimore: Johns Hopkins University Press, 2010. Print.
Stivale, Charles J. *The Two-fold Thought of Deleuze and Guattari: Intersections and Animations*. New York: Guilford, 1998. Print.
Taguchi, Hillevi Lenz. "A Diffractive and Deleuzian Approach to Analysing Interview Data." *Feminist Theory* 13.3 (2012): 265-81. Web.
Taylor, Carol. "Close Encounters of a Critical Kind: A Diffractive Musing In/between New Material Feminism and Object-oriented Ontology." *Cultural Studies? Critical Methodologies* 16.2 (2016): 201-12. Web.
Taylor, Janelle S. *The Public Life of the Fetal Sonogram: Technology, Consumption, and the Politics of Reproduction*. New Brunswick: Rutgers University Press, 2008. Print.
Thiele, Kathrin. "Ethos of Diffraction: New Paradigms for a (post) Humanist Ethics." *Parallax* 20.3 (2014): 202-16. Web.
Thiele, Kathrin. "In Critical Condition or Fully Out of Steam? Critical Thinking Today." *Gegen/Stand Der Kritik* (2012): n. pag. Web.
Thiele, Kathrin. "Theorizing is Worlding—Teaching New Feminist Materialisms in Contemporary Feminist Theory Courses." *Signs: Journal of Women in Culture and Society* 28 (2003): 801-31. Web.
Thompson, Charis. *Making Parents: The ontological choreography of reproductive technologies*.

MIT Press, 2005.
Tiainen, Milla, Katve-kaisa Kontturi, and Ilona Hongisto. “Preface: Movement, Aesthetics, Ontology.” *Cultural Studies Review* 21.2 (2012): n. pag. Web.
Tomkins, Silvan S. *Affect, Imagery, Consciousness*. New York: Springer, 1991. Print.
Trinh, Minh-ha T. “Not You/like You: Postcolonial Women and the Interlocking Questions of Identity and Difference.” *Inscriptions* 3 (1988): 71-77. Web.
Törnberg, Anton. “Resistance Matter (s): Resistance Studies and the Material Turn.” *Resistance Studies Magazine* 2013 (2013): n. pag. Web.
Tuana, Nancy. *Feminism & Science*. Bloomington: Indiana University Press, 1989. Print.
Tuana, Nancy. “Viscous porosity: witnessing Katrina,” in Hekman, S. and Alaimo, S. eds. *Material feminisms*. (2008).
Udén, Maria. “A Located Realism: Recent Development within Feminist Science Studies and the Present Options for Feminist Engineering.” *Women's Studies International Forum* 32.3 (2009): 221-26. Web.
Unnikrishna, C. S. “The Schrödinger Cat: Physics, Math, and Philosophy.” *History of Science and Philosophy of Science: A Historical Perspective of the Evolution of Ideas in Science*. Ed. Debi Prasad Chattopadhyaya and Pradip Kumar Sengupta. 6th ed. Vol. XIII. Delhi: Pearson, 2010. 313-38. Print.
Van der Tuin, Iris. “Deflationary Logic: Response to Sara Ahmed.” *European Journal of Women’s Studies* 15.4 (2008): 411-16. Web.
Van der Tuin, Iris. “'A Different Starting Point, a Different Metaphysics': Reading Bergson and Barad Diffractively.” *Hypatia* 26.1 (2011): 22-42. Web.
Van der Tuin, Iris, and Aud Sissel Hoel. “The Ontological Force of Technicity: Reading Cassirer and Simondon Diffractively.” *Philosophy & Technology* 26.2 (2013): 187-202. Web.
Van der Tuin, Iris. “On The Threshold of New Materialist Studies.” *FORUM: University of Edinburgh Postgraduate Journal of Culture & the Arts*. No. 19. (2014). Web.
Van der Tuin, Iris. *Generational Feminism: New Materialist Introduction to a Generative Approach*. Lanham: Lexington, 2015. Print.
Van der Tuin, Iris. “Reading Diffractive Reading: Where and When Does Diffraction Happen?” *Journal of Electronic Publishing* 19.2 (2016). Web.
Van der Tuin, Iris. “Microaggressions as New Political Material for Feminist Scholars and Activists: Perspectives from Continental Philosophy, the New Materialisms, and Popular Culture.” *Australian Feminist Studies* 31.89 (2016): 246-62. Web.
Vasquez, Manuel A. *More than Belief: A Materialist Theory of Religion*. Oxford: Oxford University Press, 2011. Print.
Walby, Sylvia. *Theorizing Patriarchy*. Oxford: Blackwell, 1991. Print.
Wallace, David. *The Emergent Multiverse: Quantum Theory According to the Everett Interpretation*. Oxford: Oxford University Press, 2014. Print.
Whitehead, Alfred North. *The Concept of Nature*. Memphis: General, 2010. Print.
Whitehead, Alfred North. *Process and Reality: Corrected Edition.* Edited by D.R. Griffin and D.W. Sherburne. New York: Free Press, 1978.
Williams, James. *Gilles Deleuze's Difference and Repetition: A Critical Introduction and Guide*. Edinburgh: Edinburgh University Press, 2003. Print.
Wilson, Elizabeth A. *Psychosomatic: Feminism and the Neurological Body*. Durham: Duke University Press, 2004. Print.
Wing Sue, Derald. *Microaggression in Everyday Life: Race, Gender and Sexual Orientation.*

Hoboken: Wiley & Sons, 2010. Print.
Wolfe, Cary. "Of Ecology, Immunity, and Islands: The Lost Maples of Big Bend." *Posthumous Life: Theorizing beyond the Posthuman*. Ed. Jami Weinstein and Claire Colebrook. New York: Columbia University Press, 2017. N. pag. Print.
Wylie, Alison. "Feminist theories of social power: Some implications for a processual archaeology." *Norwegian archaeological review* 25.1 (1992): 51-68.
Xenophon. *The Minor Works of Xenophon: Viz. Memoirs of Socrates; The Ban Quet; Hiero, on the Condition of Royalty; and Economics, or the Science of Good Husbandry*. Trans.
Sarah Fielding, James Welwood, Richard Graves, and Richard Bradley. London: Printed for J. Walker, 1813. Print.
Young, Iris Marion. "Throwing like a girl: A Phenomenology of Feminine Body and Comportment Motility and Spatiality." *Human Studies* Vol. 3, No. 2 (April 1980): 137-156.
Zamberlin, Mary Frances. *Rhizosphere: Gilles Deleuze and the "Minor" American Writings of William James, W.E.B. Du Bois, Gertrude Stein, Jean Toomer, and William Faulkner*. New York: Routledge, 2006. Print.
Zdebik, Jakub. *Deleuze and the Diagram: Aesthetic Threads in Visual Organization*. London: Bloomsbury Academic, 2014. Print.
Zettili, Nouredine. *Quantum Mechanics: Concepts and Applications*. West Sussex: John Wiley & Sons, 2009. Print.
Žižek, Slavoj. *Less than Nothing: Hegel and the Shadow of Dialectical Materialism*. London: Verso, 2013. Print.
Žižek, Slavoj. *Organs without Bodies on Deleuze and Consequences*. London: Routledge, 2012. Print.