Quantum Derrida
Barad’s Hauntological Materialism

Faith is a cascade.

—Alice Fulton, “Cascade Experiment”

At the end of *The New Wounded*, Malabou suggests that a wounded subject could be so intensely wounded that she could no longer be capable of responding to a person or a situation with affect or transference. She asks, “How could we deny that the new wounded call responsibility into question?”¹ If the inability of the patient to respond calls into question responsibility, this suggests that “between psychoanalysis and neurology, it is precisely the sense of ‘the other’ that is displaced.”² If the other is displaced from subjectivity in neurology and neurological brain damage, then we might have to seek it elsewhere, on the basis of what Malabou calls “a non-transferential clinic,” or an analysis that does not depend primarily on the other’s conscious recognition.

One of the ways I am trying to read Derrida is by displacing his philosophy to an other context, one that is more explicitly material and plastic. For Malabou, plasticity is the sign of a neurological paradigm and the site of a biological materialism. My turn to the work of Karen Barad here is not meant to invalidate the significance of biology or to undermine the importance of Malabou’s philosophy, but to offer another displacement, a “nontransferential clinic” of quantum physics where a quantum Derrida operates. This shift to the quantum level, and in particular quantum field theory, allows us to further reflect on two threads that have already been acknowledged in this book.

The first theme is the underdeveloped third entity of Derrida’s questioning of Heidegger’s threefold schema of stone, animal and human. It appears
that in his late work Derrida was obsessed with these Heideggerian theses from Heidegger’s lecture course on *The Fundamental Concepts of Metaphysics*. Derrida intervenes into Heidegger’s theses most intensively on the notion of the animal. Heidegger distinguishes the animal, which is poor in world, from the stone, which simply lacks a world, and the human being, who possesses the capacity of world-building. Derrida challenges the separation Heidegger sets forth between the animal and the human. In Chapter 6 of *Of Spirit*, for example, Derrida challenges Heidegger’s denial of world and spirit to the animal in his infamous Rectorship address. Here, Heidegger claims that “the world is always a spiritual world,” and “the animal has no world”; therefore “the animal has no spirit since, as we have just read, every world is spiritual. Animality is not of spirit.”

Derrida does not really reflect on the situation of the stone in his multiple engagements with Heidegger, although he does express astonishment that Heidegger uses a particular example here rather than a general category of an inanimate object. He asks: “Why does he take the example of an inanimate thing, why a stone and not a plank or a piece of iron, or water or fire?” At the same time, as we have already seen, Derrida says in “Rams” that “for reasons I cannot develop here, nothing appears to me more problematic than these three theses.” He not only questions the thesis about the animal; he also implies that the thesis about the stone being worldless is problematic, at least in comparison to the animal and the human. A stone is an object, and objects are much more complicated than we might suppose, as discussed in Chapter 5. In this chapter, however, I want to consider what kind of objects are subatomic particles?

The second theme of Derrida’s that I want to develop here in relation to quantum physics is the provocative claim that “all other is all other.” This the phrase suggested in the last chapter of *The Gift of Death*, the idea that “tout autre est tout autre.” In *The Gift of Death*, Derrida reads Kierkegaard’s *Fear and Trembling*, with its reflection on the Aqedah where Abraham nearly sacrifices Isaac. In his reading, Derrida generalizes the situation of sacrifice treated in the biblical story, and he understands that the ram substitutes as a sacrifice for Isaac but that does not do away with the sacrificial economy with which we continue to operate. Our civilized society “puts to death or . . . allows to die of hunger and disease tens of millions of children . . . without any moral or legal tribunal ever being considered competent to judge such a sacrifice, the sacrifice of others to avoid being sacrificed oneself.” He says that we possess no authority, institution, or criteria to decide or “to determine with any degree of certainty who is responsible or guilty for the hundreds of thousands of victims who are sacrificed for what or whom one knows not, countless victims, each of
whose singularity becomes each time infinitely singular, every other (one) being every (bit) other."^{7}

Here in *The Gift of Death*, the phrase *tout autre est tout autre* is translated as “every other (one) being is every (bit) other.” Every other individual person is absolutely unique and other, as valuable and worthy in his or her singularity that brooks no logic of comparison, even though we carelessly compare all the time. Derrida then, following Kierkegaard in a way, extends this phrase to indicate divinity: “‘Every other (one) is God,’ or ‘God is every (bit) other.’”^{8} If God is the wholly Other, the source of absolute alterity, then it makes sense to think of God as the Other. But again, Derrida generalizes: he extends this divine alterity to every one as other. He undermines the separation that Kierkegaard upholds between humanity and divinity. Here God and the person are substitutable in their infinite otherness.

In *Fear and Trembling*, Kierkegaard, writing as Johannes de Silentio, posits a religious realm that lies beyond that of ethics. Ethics for Silentio is the home of the rational universal, which means that religion becomes, strictly speaking, absurd. Abraham is the paradigm of religious faith because he obeys the command to kill his son even though it is horrific and immoral. Abraham has faith that he will retain Isaac and the promise of his descendants, despite his expectation that he will kill Isaac. Derrida generalizes the situation of Abraham’s faith, to indicate the sacrificial situation that confronts us all, whether we believe it or not.

At the end of the book, Derrida shifts from Kierkegaard to Nietzsche. In the *Genealogy of Morals*, Nietzsche meditates on the phrase from the Gospel of Matthew (6:19–21) that admonishes Christians not to store their treasures here on earth, but to “lay up for yourselves treasures in heaven,” “for where treasure is, there your heart will be also.”^{9} Derrida follows Nietzsche in his critique of Christianity as the spiritualization of an economic exchange, and we saw some of the effects of this economy in Chapter 2, as reflected in *Merchant of Venice*. The earthly treasure is subordinated to a heavenly treasure that is infinitely more rewarding because it is deferred. Similarly, Christ’s teaching, reflected in the Sermon on the Mount, introduces an infinite asymmetry, a “gift, a love *without reserve*” that reproduces the economy of sacrifice at a higher level.^{10} This is what Nietzsche refers to as the “stroke of genius called Christianity”: “In questioning a certain concept of repression that moralizes the mechanism of debt in moral duty and bad conscience, in conscience as guilt, one might develop further the hyperbolization of such a repression.”^{11} The logic of sacrificial debt is not abolished in Christian sacrifice; it is universalized and infinitized. Jesus’s sacrifice does not put an end to sacrifice; it interiorizes sacrifice as self-sacrifice of one’s desire.
At the end of *The Gift of Death*, Derrida argues that “if there is such a thing as this ‘stroke of genius,’ it only comes about at the instant of the infinite sharing of the secret.” What is the secret of Christianity? It is the secret of sacrifice as debt and, more important, as credit. Christians are those who believe in this hyperlogic of sacrifice, this unbelievable cosmic expansion of debt that exposes us all to sacrificial death unless we can be redeemed by our belief. Here is

the reversal and infinitization that confers on God, on the other or on the name of God, the responsibility for that which remains more secret than ever, the irreducible experience of belief, between credit and faith, the believing suspended between the credit of the creditor and the credence of the believer. How can one believe this history of credence or credit?

There is a knot of belief, of credit and debt, at the heart of Christianity. But it applies not only to Christianity because this Christian logic becomes the logic of the West, what Derrida calls “globalatinization” in his essay “Faith and Knowledge.”

What about science? Does modern science, which arose in what we call the “West,” contain this structure of belief and sacrifice? Do we believe in the existence of subatomic particles such as quarks, for example? What credit is extended to scientific procedures, theories, and facts, and how do these practices of credence or skepticism place us in debt? A new discipline of science studies has emerged at the end of the twentieth century to reflect not only on the history and politics of science, but also a sociology of science practice. Probably the most influential book about science on intellectual academic non-scientists in the twentieth century is Thomas Kuhn’s *The Structure of Scientific Revolutions*. Kuhn pays attention to the history of science and distinguishes between normal science according to an established paradigm, and revolutionary science, whereby one paradigm is replaced by another. In his usage of the term “paradigm,” Kuhn draws on discussions with Stanley Cavell and others about Wittgenstein, and he makes an explicit analogy between scientific and political revolutions. Furthermore, Kuhn suggests that the replacement of one paradigm by another is not due to logic, but operates more like a conversion. In this situation, because rules are paradigm determined, a scientist cannot rely on the evidence “provided by problem-solving.” Ultimately, the scientist must “have faith that the new paradigm will succeed with the many large problems that confront it, knowing only that the older paradigm has failed with a few. A decision of that kind can only be made on faith.”
In Derridean terms, in what ways is science sacrificial? In the third essay of his Genealogy of Morals, Nietzsche argues that science remains under the sway of an ascetic ideal, an unquestioned allegiance to the will to truth. Asceticism is the sacrifice of earthly pleasures for spiritual rewards. Our "modern science," Nietzsche declares, "is the best ally the ascetic ideal has at present, and precisely because it is the most unconscious, involuntary, hidden, and subterranean ally!" Does contemporary science remain the best ally of the ascetic ideal, or does it represent something different?

I am not a scientist and lack the expertise in experimental and mathematical methods to evaluate the scientific legitimacy of science. Part of the reason for this is the hyperspecialization of knowledge in modern and contemporary civilization, which sunders scientific technical knowledge from more theoretical humanities-based knowledge. In his later work, Derrida kept a critical distance from the natural sciences, but recent expressions of Continental philosophy have re-engaged with natural sciences, including biology, neurology, chemistry, physics, cosmology, and mathematics. In this chapter, I want to think about a Derridean science, in this case quantum physics, even though I do not possess the expertise to understand or evaluate quantum physics in strictly scientific terms.

We require intermediaries, including scientists as well as philosophers and sociologists of science, to help us interpret and understand scientific laws and theories. This necessity for intermediation is not restricted to science, of course, and exists in any area of knowledge. In addition to the need for expert scientists, however, we also learn that scientists themselves require something to intermediate for them. Scientific discoveries require and rely upon an apparatus. So again, what does it mean to believe in and be indebted to an apparatus, especially in areas such as particle physics where nobody is capable of seeing without the aid of complex technical apparatuses that function as prostheses?

One way to read Karen Barad’s work is to see her as doing something analogous to what Derrida is doing with Kierkegaard in The Gift of Death: By focusing on the apparatus, she is generalizing this situation of credit and debt in quantum physics to science in general. The apparatus is the locus of belief for science, which is also the place where acesis and debt, infinite asymmetry and sacrifice, take place, even if she does not use this language. I will unpack this analogy further between what Barad is doing with quantum physics and what Derrida is doing with philosophy, ethics, and religion. At a certain point, however, the analogy breaks down in two directions: first, the situation in experimental scientific practice is absolutely different from that of philosophical reflection; and second and
more important, the analogy is not just an analogy, especially if tout autre is tout autre.

In the early twenty-first century, Barad’s book *Meeting the Universe Halfway* has had a significant impact on philosophers and other nonscientist academics. Barad draws on science studies, feminism, poststructuralism, and her own expertise as a theoretical physicist to fashion a powerful articulation of how the quantum world impinges on our own. According to Barad, “quantum mechanics is not a theory that applies only to small objects; rather, quantum mechanics is thought to be the correct theory of nature that applies at all scales.”16 The problem is how to understand quantum physics because the experimental results of quantum phenomena have outstripped our capacity to make sense of them.

Barad offers a new ontology, an “agential realist ontology,” to account for quantum phenomena. Entities in the world not only interact; they intra-act, and the world is constituted in and through their intra-actions. “The world,” Barad states, “is an open process of mattering through which mattering itself acquires meaning and form through the realization of different agential possibilities.”17 Objects are not static things, but dynamic processes that change in their interaction and intra-action with other objects. Dynamics is not what happens between things, but how these things become what they are as they transform themselves and their objects in a mutual asymmetrical process of materialization.

Barad shifts our focus from things or objects to apparatuses. Apparatuses for Barad “are not mere observing instruments, but boundary-drawing practices—specific material (re)configurings of the world—which come to matter.”18 Here apparatuses are not simply devices in a laboratory but “material-discursive practices” that constitute phenomena, including how we conceive their relationships and intra-activity, and ultimately our entire world of “nature” and “culture.”19 Barad is a posthumanist, challenging the separation between human culture and the objective natural world. Agency and intelligibility are not restricted to human activity, but shared among various phenomena. Phenomena are constructed, but not solely by human means.

Phenomena are “ontologically primitive relations.” The understanding of these relations, or intra-actions, challenges our traditional conception of causality, and leads Barad to the claim that “phenomena are the ontological inseparability of intra-acting ‘agencies.’ That is, phenomena are ontological entanglements.”20 An apparatus is a construct that intervenes into phenomena, producing an “agential cut” that effects a separation between what we call a subject and what we consider an object. As McKenzie Wark explains, “There is no good way of discriminating between the apparatus

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and its object. No inherent subject/object distinction exists. There is an apparatus-phenomena-observer situation.” The apparatus is the key concept here, loosed from the framework of traditional scientific boundaries.

In Meeting the Universe Halfway, Barad offers a reinterpretation of Niels Bohr that counters how he is sometimes downplayed in comparison to Werner Heisenberg and Erwin Schrödinger. In doing so, she revisits the famous double-slit experiment, where a stream of electrons is directed one by one at a barrier with two openings, with a screen behind it to record the location that the electrons strike the screen. The issue here is how the experiment presumes a number of discrete electrons, but the resulting pattern is an interference pattern, which is the result of wavelike behavior. “Unlike the behavior of water waves, which go through both slits at once, the electrons are sent through one at a time. Does an individual electron ‘interfere’ with itself? Does a single electron somehow go through both slits at once? How can this be?”

Bohr relies on a variation of this experiment to formulate his notion of complementarity. He conducts a thought experiment that suggests that if a device could measure which path the electron takes—which slit it goes through—then the interference pattern would disappear because the result would look like the electrons are simply particles. This is part of a theoretical dispute about the nature of quantum phenomena with Einstein. Bohr claims that for subatomic quantum particles, “wave and particle behaviors are exhibited under complementary—that is, mutually exclusive—circumstances.” Bohr is the originator of the so-called Copenhagen interpretation of quantum mechanics, which is the idea that the strange behavior of these particles is not due to our inability to observe or measure them correctly, but somehow intrinsic to the phenomena themselves.

Barad argues that complementarity depends on the experiment, and more importantly, the apparatus. If the electron double slit experiment could be conducted with a measurement that determines which path each electron passes through, then the result is a classical one that makes it look like the electron is a particle. But when the experiment is conducted as it usually is, without determining which slit each electron passes through, the electrons demonstrate the interference pattern that is common to wave interaction and superposition. She cites later experiments of Scully et. al. in the late 1980s and early 1990s that are able to determine which path the electron takes, and these experiments show that Bohr was correct. Wave particle complementarity exists, and this complementarity is an ontological notion. “What is the result?” Barad asks. She says that “despite the lack of disturbance [that was the counterargument of Einstein and others, that the striking of the screen ‘disturbs’ the experiment and creates the
appearance of interference] the experimenters nonetheless confirm the existence of which-path-interference complementarity. Complementarity is not the result of an epistemic uncertainty; it is the result of an ontological indeterminacy.

Many nontechnical readers of quantum physics cite the famous Heisenberg “Uncertainty Principle,” which states that the measurement of a particle’s location cannot be fixed if we want to specify its momentum, or vice versa. This uncertainty exists across a very tiny range, which is measured by a fraction of Planck’s constant, $\hbar$. Heisenberg’s uncertainty is often seen as an epistemological uncertainty, due to the limitations of our measuring devices. But Bohr argued that our lack of knowledge is ontological, based on a fundamental indeterminacy of reality. Barad says that

Bohr understands entanglements in ontological terms (what are entangled are the “components” of phenomena. For Bohr, phenomena—entanglements of objects and agencies of observation—constitute physical reality; phenomena (not independent objects) are the objective referent of measured properties. Complementarity is an ontic (not merely an epistemic) principle. Phenomena are entangled, and their intra-actions can be teased out by interacting (and intra-acting) with them by means of an apparatus.

What does this understanding of quantum physics have to do with Derrida? Although Barad does not explicitly cite Derrida in *Meeting the Universe Halfway*, she does engage with Derrida’s work in other articles. I will look at two of them to show how Barad understands Derrida’s philosophy as a hauntological materialism.

In “Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, SpaceTime Enfoldings, and Justice-to-Come,” an article published in the journal *Derrida Today* in 2010, Barad uses Derrida’s term “hauntology” from *Specters of Marx* to describe the world of quantum phenomena. She acknowledges the materialist readings of Derrida by Vicki Kirby and Astrid Schrader as influences for her interpretation. In this article, Barad revisits some of the quantum material from *Meeting the Universe Halfway*, including her understanding of Bohrian indeterminacy. She also reflects on how quantum superposition indicates a state of quantum entanglement.

The most famous example of this superposed state is Schrödinger’s hypothesis about a cat whose life or death is determined by the state of decay of an atom. If the atom decays, it releases a gas that kills the cat. The classical presumption is that the atom is either in a state of decay or not,
and therefore the cat is either alive or dead. The quantum suggestion is that somehow the cat is in a strange intermediate state, neither alive nor dead, or else both alive and dead at the same time.

Barad clarifies this situation. She argues that:

A quantum superposition is a nonclassical relation among different possibilities. In this case, the superposition of “alive” and “dead” entails the following: it is not the case that the cat is either alive or dead and that we simply do not know which; nor that the cat is both alive and dead simultaneously (this possibility is logically excluded since “alive” and “dead” are understood to be mutually exclusive states); nor that the cat is partly alive and partly dead (presumably “dead” and “alive” are understood to be all or nothing states of affair); nor that the cat is in a definitive state of being not alive and not dead (in which case it presumably wouldn’t qualify as a (once) living being). Quantum superpositions radically undo classical notions of identity and being (which ground the various incorrect interpretative options just considered). Quantum superpositions (at least on Bohr’s account) tell us that being/becoming is an indeterminate matter: there simply is not a determinate fact of the matter concerning the cat’s state of being alive or dead. It is a ghostly matter! But the really spooky issue is what happens to a quantum superposition when a measurement is made and we find the cat definitively alive or dead, one or the other.26

Quantum superposition means that phenomena are entangled in such a spooky way that there is no simple either/or.

Superposition is related to entanglement, which is the entanglement of particles and states in a nonclassical way. These states have to be measured, which makes the entanglement of a live and dead cat “decohere” into a classical situation where the cat is either dead or alive. Furthermore, this situation of quantum entanglement suggests nonlocality, which Einstein derisively called “spooky action at a distance.” Given two entangled states or particles, say two electrons whose spin is correlated, then measuring one of the electrons gives the spin of the other one, no matter how far apart they are. And the result of this measurement happens faster than the speed of light. This understanding of entanglement is the result of Bell’s Theorem, which John Bell proposed in the 1964 as a way of answering the challenge that Einstein proposed along with Boris Podolsky and Nathan Rosen known as the EPR paradox. Alain Aspect and others then carried out experiments in the early 1980s that confirmed Bell’s theory and the predictions of quantum mechanics against Einstein’s criticisms.
According to Barad,

*Quantum entanglements* are generalised quantum superpositions, more than one, no more than one, impossible to count. They are far more ghostly than the colloquial sense of ‘entanglement’ suggests. *Quantum entanglements* are not the intertwining of two (or more) states/entities/events, but a calling into question of the very nature of two-ness, and ultimately of one-ness as well.27

She argues that Derrida’s philosophy offers a better way to understand this situation than many of the interpretations supplied by quantum physicists. Words, concepts, phenomena are entangled in complex ways, and deconstruction attends to the manner in which such phenomena are spookily entangled.

This is a materialism of a sort, but a very strange kind of materialism, that Barad calls a hauntological materialism. Our entangled intra-actions as large slow beings repeat in a different way the relations among subatomic particles. We come to face our past lives and previous historical figures as ghosts, exerting a hauntological influence on the present. We encounter these ghosts of our past in a time “out of joint,” as Derrida quotes Hamlet in *Specters of Marx*. Furthermore, these ghosts are encountered in the flesh, as iterative materialisations, contingent and specific (agential) reconfigurings of spacetime/matterings, spectral (re)workings without the presumption of erasure, the ‘past’ repeatedly reconfigured not in the name of setting things right once and for all (what possible calculation could give us that?), but in *the continual reopening and unsettling of what might yet be, of what was, and what comes to be.*28

For Barad, there is an ethics of responsibility derived from Derrida’s work that offers a sense of justice or doing justice in relation to her understanding of quantum physics.

There is an ongoing materialization of matter, and an ongoing dynamic production of space and time, as the framework within which phenomena interact and intra-act. The apparatus names the agential cut that gives us the appearance of disparate phenomena, but we are still haunted, affected, and effected by the entangled superposition these phenomena remain, at least virtually. Responsibility involves “facing the ghosts, in their materiality, and acknowledging injustice without the empty promise of complete repair.”29 Quantum phenomena are intrinsically spooky, and they haunt us no less than larger scale phenomena.
In her article on “Quantum Entanglements and Hauntological Relations of Inheritance,” Barad does not simply comment on Derrida’s work. She quotes him at points, and then shows how his ideas are relevant to the world of quantum physics. In another article, “On Touching: The Inhuman That I Therefore Am,” she reflects on the paradox of touch within the context of quantum field theory, and connects this idea to Derrida’s book *On Touching—Jean-Luc Nancy*. The paradox Barad starts with is that for physicists, phenomena do not actually touch. In physical terms, touch is an electromagnetic interaction: “there is no actual contact involved.”

Touch is a paradoxical phenomenon, even at the most basic physical level. Things get even more strange when Barad discusses quantum field theory.

According to Barad, in quantum field theory “there is a radical deconstruction of identity and of the equation of matter with essence in ways that transcend even the profound un/doings of (nonrelativistic) quantum mechanics.” In quantum field theory, a particle is the expression of the entire field at a specific point, a quantum. And conversely, the field is the expansion or generalization of the particle. For example, the photon is the quantum of an electromagnetic field. The particle and the field are two complementary ways of understanding the same phenomenon. Furthermore, the particle and the field are entangled with a void. Particles do not exist within a void; they are constitutively entangled with the void.

The void is not a simple vacuum; it is “a living, breathing indeterminacy of non/being.” The vacuum is full of virtual particles.

What is a virtual particle? When quantum physicists explore the ways that particles act, they discover that these particles give rise to virtual particles, particles that appear to jump into existence and then just as quickly jump back out of it. There is a sort of perversity intrinsic to these fundamental subatomic particles. Richard Feynman said the following about electrons: “Instead of going directly from one point to another, the electron goes along for a while and suddenly emits a photon; then (horrors!) it absorbs its own photon. Perhaps there’s something ‘immoral’ about that, but the electron does it!”

Barad claims that “virtual particles are quantized indeterminacies-in-action.” These particles exhibit a propensity to touch and therefore self-touch every other possible particle as part of their paradoxical perversity. In order to handle the queer infinities produced by virtual particles and their interactions, physicists have to renormalize these infinities in practice. But that does not eliminate the strangeness of these virtual particles; it merely allows us to deal with them.
For Barad, quantum touching is a strange phenomenon, where every other particle intra-acts with itself and every other particle. Although she does not specifically refer to Derrida’s phrase from *The Gift of Death*, *tout autre est tout autre*, I think it fits even better her description of the strange interactions and intra-actions of quantum field theory. These intra-actions can be characterized as what Barad calls an “infinite alterity,” and she summons a Derridean responsibility to do justice to this insensible indeterminacy of being. In a quantum field where quantized particles self-touch in virtual ways, every other is indeed every other. Self-touching is a kind of self-sacrifice because these virtual particles are created and destroyed in a wink of existence. Matter is transient: “No longer suspended in eternity, matter is born, lives, and dies.” Here is a certain end of the Heideggerian thesis, where the inanimate thing is not a worldless stone but a virtual particle that inhabits *worlds without end*.

Barad refuses the Heideggerian refusal of a world for the stone; she offers an opening to the inhuman that we also are. For Barad, ethics involves “a recognition that it may well be the inhuman, the insensible, the irrational, the unfathomable, and the incalculable that will help us face the depths of what responsibility entails.” Responsibility, sacrifice, and the gift of death inhabit and haunt quantum worlds, even when the world as such is gone. There are no worlds, only superposed islands of indeterminacy. Waves, particles, void, all entangled.

Karen Barad is not the only philosopher who is thinking about quantum physics. In recent years, François Laruelle has developed his non-philosophy into what he calls a non-standard philosophy based on quantum phenomena. In his book *Philosophie Non-Standard*, published in French in 2010 and not yet translated into English, Laruelle makes explicit use of concepts from quantum physics to explicate non-philosophy. He argues for a more quantum-theoretical conception of the Real, and suggests that the wave-particle complementarity of quantum physics offers a better model for theoretical thinking than atomic entities. Laruelle says that non-philosophy does not intervene directly in quantum physics, but rather takes the same relation to philosophy as quantum physics does to classical physics, which is less one of inclusion and more one of generalization along reconstituted lines.

Laruelle claims that while traditional philosophy deals with discrete, corpuscular objects and concepts, these concepts are deformed by the implications of wave superposition. Laruelle wants to superpose philosophical concepts together, which is a scientific operation, or what he calls “the unity of a fusion of science and philosophy under science.” This fusion is the result of superposition, which constitutes a radical immanence,
not absolute in the sense of being opposed to transcendence, but radical in the sense of being composed immanently by super-imposing concepts and seeing how they amplify or reduce each other. Non-standard philosophy works with superposed terms rather than simply discrete classical ideas. These are complex ideas as opposed to simple ideas, in the way that complex numbers include not only real numbers but also an imaginary component, which is the square root of $-1$, written as $i$. Laruelle says that an imaginary number can be thought of as a “quarter-turn” backwards from a circle, which is an immanent subtraction from the binary doublet of immanence/transcendence.\(^\text{41}\)

Laruelle’s terminology and writing is incredibly complex, and it is made more so by the fusing together of philosophical ideas and concepts, which he subjects to his own rigorous non-philosophical formulations, with quantum ones. I am not going to try to fully explain Laruelle’s philosophy—and in truth I could not do it justice—but I want to give a sense of what he is doing and how it compares to Barad’s work. Barad is using the language of Derrida, Levinas, and other poststructuralist philosophers to articulate and explain quantum phenomena, and this helps us read these theorists beyond any sort of naïve humanism or linguisticism. Laruelle thinks that poststructuralist philosophers, despite their desire to expose philosophy to an infinite alterity, end up confirming and upholding the traditional status of philosophy and its authority to interpret the world. For Laruelle, non-philosophy is the attempt to use philosophical ideas and categories without reinforcing the sufficiency of philosophy’s mastery of the world. Laruelle uses quantum terminology and concepts to rethink and refashion what normally goes by the name of philosophy.

Derrida himself claims that what Laruelle does is to reinstate a kind of authority of science over philosophy. In a debate from 1988, Derrida suggests:

> Then you went on to oppose to this description [of the sufficiency of philosophy] this new science, which you distinguished from its political, social, etc., appropriations, and there, obviously, I had the impression that you were reintroducing philosophemes—the transcendental being only one of them—into this description, this conception of the new science, the One, the real, etc. There, all of a sudden, I said to myself: he’s trying to pull the trick of the transcendental on us again, the trick of auto-foundation, auto-legitimation, at the very moment when he claims to be making a radical break.\(^\text{42}\)

And Laruelle replies by acknowledging that from a philosophical standpoint what he’s doing appears crude and contradictory, but that he allows
himself “the right, the legitimate right, to use philosophical vocabulary non-philosophically.” Laruelle claims that although Derrida uses philosophy against itself, against its own pretensions to absolute knowledge, he still does so in the name of something like philosophical logic itself. Laruelle appeals to science, which “makes a non-positional, non-thetic use of language” to think outside of and beyond philosophy itself. And in *Philosophie Non-Standard*, Laruelle appeals to the science of quantum physics to think philosophy otherwise.

Gilles Deleuze is impressed by Laruelle’s project, although he also suggests that Laruelle grants too much authority to science. In his last book, *What is Philosophy?*, published in French in 1991 and co-authored with Félix Guattari, Deleuze writes in a footnote that “François Laruelle is engaged in one of the most interesting undertakings of contemporary philosophy. He invokes a ‘One-All’ that he qualifies as ‘nonphilosophical’ and, oddly, as ‘scientific,’ on which the ‘philosophical decision’ takes root. This One-All seems to be close to Spinoza.” Deleuze appreciates the effort to construct a non-philosophy along Spinozist lines, but he hesitates before Laruelle’s evident scientism, commenting that “we do not see why this real of science is not nonscience as well.”

Part of the question at stake is the nature and role of science, and to what extent the appeal to quantum physics, mathematics (as in the set theory invoked by Alain Badiou), or biology involves a kind of trumping of philosophical practice by the discipline of the natural sciences. Unfortunately, most scholars trained in philosophical or other humanities-based disciplines lack the technical expertise to evaluate scientific ideas, but even scientists trained in a certain discipline lack the expertise to evaluate another discipline. From my perspective, after his early work on geometry, anthropology, and linguistics, Derrida is a little too skeptical of the natural sciences, whereas sometimes philosophers, such as Laruelle, Badiou, Meillassoux, and adherents of Speculative Realism and object-oriented ontology give science too much weight. I do think, however, that we need to try to understand and think about scientific ideas, even if we are non-scientists. And this is what Barad’s work gives us tools to do.

By way of a conclusion, I suggest that what Barad calls “diffraction” functions as a kind of quantum *différance*. In *Meeting the Universe Halfway*, Barad says that “there is a deep sense in which we can understand diffraction patterns—as patterns of difference that make a difference—to be the fundamental constituents that make up the world.” Diffraction in classical terms occurs with waves, including ocean waves. As waves interact with other waves or with an object, new patterns are formed. A diffraction pattern is also an interference pattern because of the way that
waves, or waves and objects, interfere with each other. When a wave meets another wave, depending on the wavelength it can either cancel out the other wave or amplify it. We can also see an interference pattern or a diffraction pattern when a wave hits a gap or hole as in a breakwater.

Diffraction is “an entangled phenomenon” that takes place in large-scale classical phenomena, as well as in quantum subatomic phenomena. Barad explains that when waves meet and interact, they combine to form a new wave. “The resultant wave,” she says, “is a sum of the effects of each individual component wave; that is, it is a combination of the disturbances created by each wave individually.” The combination of individual waves is called superposition, a term that Laruelle also uses. Superposition works at quantum and large-scale levels, and it produces a diffraction pattern.

As McKenzie Wark explains in his discussion of Barad’s work, “diffraction is not about how one thing is an imaginary reflection or double of another.” Difference involves a joint or co-production of new phenomena. “Diffraction is about how things pass through and produce differential patterns,” and these patterns are real at the level of material-physical phenomena. The apparatus is that object or entity that measures the result of this process and evaluates in what way it is a novel phenomenon.

A diffraction pattern is a pattern that is constituted by a differentiator—a situation that prompts difference to relate to difference. When we think about differences, we usually think about difference as derivative from or subordinate to identity. How can we compare anything except a prior identity from which something differs? Here, the powerful reorientation of poststructuralism as epitomized in the philosophy of Derrida and Deleuze is the contention that differences are primary, and that differences can relate to differences without depending on a pre-given identity.

Deleuze develops this notion most explicitly in Difference and Repetition. According to Deleuze, in order to relate difference to difference there exists what he calls a second-degree of difference, a differentiator. He says that for this second-degree of difference to operate, differences must be organized into a series. First of all, there have to be at least two series, and second, there must be a communication between these series, a “force” or intensity that “relates differences to other differences.” It is the “intensive character of systems” or series that is important here, the manner by which difference is related to difference, the construction of a second-order difference. An intensive field communicates differences to differences, and produces individuations. According to Deleuze, “once communication between heterogeneous series is established, all sorts of consequences follow within the system. Something ‘passes’ between the borders, events explode, phenomena flash, like thunder and lightning.”
In order to recognize difference as difference, or to distinguish between and among differences, we would seem to need to refer to a kind of resemblance or identity. We assume a privileged path of thinking from identity to difference, but as a matter of fact it’s the reverse: “Thunderbolts explode between different intensities, but they are preceded by an invisible, *dark precursor*, which determines their path in advance but in reverse, as though intagliated.”52 This is because of the pressure differential in thunderstorms: “Likewise, every system contains its dark precursor which ensures the communication of peripheral series.” The dark precursor is the differentiator, and it is also what in Deleuze and Guattari’s later work becomes the plane of immanence or plane of consistency. Deleuze explains:

There is no doubt that *there is* an identity belonging to the precursor, and a resemblance between the series which it causes to communicate. This “there is,” however, remains perfectly indeterminate. Are identity and difference here the preconditions of the functioning of the dark precursor, or are they, on the contrary, its effects?53 Deleuze argues here for the second viewpoint, which means that the dark precursor projects “upon itself the illusion of fictive identity, and upon the series which it relates the illusion of a retrospective resemblance.” There is an identity, but this identity is a transcendental illusion cast by the shadow of the dark precursor. Resemblance and identity are illusions—“in other words, concepts of reflection which would account for our inveterate habit of thinking difference on the basis of the categories of representation.”54 The dark precursor conceals itself in its operation, and this gives rise to the illusion of identity. The dark precursor is the differentiator because, “given two heterogeneous series, two series of differences, the precursor plays the part of the differentiator of these differences.”55 The dark precursor is invisible and the path it traces only becomes visible in reverse, when the lightning strikes. These differential conditions cause phenomena to occur. Difference in itself communicates to itself through a force or intensity that Deleuze names repetition. The dark precursor is “the disparate,” whereas resemblance is an effect or external result.56

A way to better understand the role of the dark precursor as the disparate is to think of it in terms of a moiré pattern. A moiré is an interference pattern that emerges when two fabrics or grids are brought together and superimposed, one on top of the other. The pattern that emerges is the difference between the two patterns. For Deleuze, differentiation occurs when two series are brought together in such a way that the differences between the two series creates a third. It’s not the identity of the points in the series
that creates identity here; it’s the relationship of difference between the
two series that generates the pattern. The dark precursor is the activity of
relating series to series, without any background, and the lightning flash is
what emerges when the two series are inter-related or inter-meshed. What
Deleuze calls the disparate indicates the process of the production of dif-
ference. Identity is generated by and out of difference.

I think that the way Deleuze understands difference in *Difference and
Repetition* is very close to how Derrida understands *différance*. Derrida coins
his neologism to take account of the dynamic aspect of difference, not just
the normal static comparison of how one word or object differs from an-
other. Difference is always differentiation, and it is a dynamic process.
Derrida more explicitly treats linguistics and analyzes the differential op-
eration of language, compared to Deleuze who is less influenced by the
developments of structural linguistics. The verb *différer*, Derrida explains,
has two distinct meanings that converge in the word *différance*. The first
involves a temporal difference: “*différer* in this sense is to temporize, to take
recourse, consciously or unconsciously, in the temporal and temporizing
mediation of a detour that suspends the accomplishment or fulfillment of
‘desire’ or ‘will,’ and equally effects this suspension in a mode that annuls
or tempers its own effect.”[^57] The second meaning of the word *différer* is
the more common notion of not being identical, although here Derrida
also introduces a dynamism, because differences resist each other in terms
of an “allergic and polemical otherness” in addition to just being different.
He argues that

> the word *différence* (with an e) can never refer to *différer* as tempori-
> zation or to *differends* as *polemos*. Thus, the word *différance* (with an a)
is to compensate—economically—this loss of meaning, for *dif-
> férance* can refer simultaneously to the entire configuration of its
> meanings.[^58]

I think that Derrida’s *différance* is very close to Deleuze’s concept of dif-
ferentiation, although Derrida claims that the problem with the term
“differentiation” is that it “would have left open the possibility of an or-
ganic, original, and homogeneous unity that eventually would have to be
divided, to receive difference as an event.”[^55] And this is how all too many
readers understand Deleuze’s philosophy, as positing an original and ho-
mogeneous unity that is then divided or differentiated. But I contend that
Deleuze’s philosophy is not nearly so simple, and that his entire problem
in *Difference and Repetition* concerns how difference relates to difference.
This is a kind of diffraction pattern, to put it in the language of Barad,
and it gives us a way to view *différance* as a physical and not just linguistic

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[^57]: 57
[^58]: 58
[^55]: 59
process. Quantum field theory involves both the dynamic temporization of time and space (understood in terms of waves or wavelike phenomena), and a dynamic differend as polemical opposition to identity (of a particle in relation to other particles) because it involves the “simultaneous” creation and destruction of virtual particles, which extends to take into account all of reality.

Because Derrida most explicitly concerns himself with the limits of language, the otherness in and of language, most readers assume that différence is a purely linguistic phenomenon. I think this is a misunderstanding of Derrida, even though he mostly investigates and applies différence to what Malabou calls the motor scheme of writing. We have the ability to read Derrida otherwise, which includes reading him in a more materialist way. There is no proper Derrida, but there are more interesting, relevant, and compelling iterations of Derrida’s thought. If we read différence as a diffraction pattern, we see how it operates outside of language, in the world, including the world of quantum physics.

In this specific sense, then, aided by the extraordinary work of Barad, we can constitute a quantum Derrida not as the only Derrida, but one more Derrida, since there is always more than one Derrida. This is a sort of fidelity, of love, even if it is also a queer reading, as Barad would affirm. I can imagine that Derrida would be hospitable to such an understanding, even if he would also resist and undercut it, seeing as how it would necessarily deconstruct. I can also imagine that Derrida loves us and that he is smiling, as his final words instruct. And this is undeconstructable.