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On Touching—
The Inhuman That Therefore I Am

When two hands touch, there is a sensuality of the flesh, an exchange of warmth, a feeling of pressure, of presence, a proximity of otherness that brings the other nearly as close as oneself.[1] Perhaps closer. And if the two hands belong to one person, might this not enliven an uncanny sense of the otherness of the self, a literal holding oneself at a distance in the sensation of contact, the greeting of the stranger within? So much happens in a touch: an infinity of others—other beings, other spaces, other times—are aroused.

When two hands touch, how close are they? What is the measure of closeness? Which disciplinary knowledge formations, political parties, religious and cultural traditions, infectious disease authorities, immigration officials, and policy makers do not have a stake in, if not a measured answer to, this question? When touch is at issue, nearly everyone's hair stands on end. I can barely touch on even a few aspects of touch here, at most offering the barest suggestion of what it might mean to approach, to dare to come in contact with, this infinite finitude. Many voices speak here in the interstices, a cacophony of always already reiteratively intra-acting

Volume 23, Number 3 DOI 10.1215/10407391-1892943

stories. These are entangled tales. Each is diffractively threaded through and enfolded in the other. Is that not in the nature of touching? Is touching not by its very nature always already an involution, invitation, invisitation, wanted or unwanted, of the stranger within?[2]

Each of the essays in this special issue touches on questions of touching: coupling and decoupling, entanglement, sensation, immersion, visual hapticity, ciliated sense, the synesthetic force of perceiving and feeling, contact, affective ecology, involution, strange and wonderful intimacies, sensory attunement, arousal, response, interspecies signaling, affectively charged multisensory dance, technological intimacies, remembering, figuring, embodied mathematics. I am struck by the intimacy of feminist science studies' engagement with science. Feminist science studies distinguishes itself in two intra-related ways: First and foremost, for all the varied approaches, foci, and philosophical commitments that go by this name, for all its diversity and because of all its diversity, it is a richly inventive endeavor committed to making a better world. Second, and relatedly, it distinguishes itself by its commitment to be *in* the science, not to presume to be above or outside of it. In other words, feminist science studies engages with the science no less than with the laboratory workers, modelers, theorists, technicians, and technologies. Indeed, the approach I find most intriguing, fruitful, grounded, rigorous, and delightful is when feminist science studies is *of* the science, materially immersed in and inseparable from it. Like good bench scientists, these practitioners work the equipment, theoretical and experimental, without any illusion of clean hands and unapologetically express their enthusiasm and amazement for the world and the possibilities of fostering just relationships among the world's diverse ways of being/becoming.

Theorizing, a form of experimenting, is about being in touch. What keeps theories alive and lively is being responsible and responsive to the world's patternings and murmurings. Doing theory requires being open to the world's aliveness, allowing oneself to be lured by curiosity, surprise, and wonder. Theories are not mere metaphysical pronouncements on the world from some presumed position of exteriority.[3] Theories are living and breathing reconfigurings of the world. The world theorizes as well as experiments with itself. Figuring, reconfiguring. Animate and (so-called) inanimate creatures do not merely embody mathematical theories; they *do* mathematics. But life, whether organic or inorganic, animate or inanimate, is not an unfolding algorithm. Electrons, molecules, brittlestars, jellyfish, coral reefs, dogs, rocks, icebergs, plants, asteroids, snowflakes, and bees

stray from all calculable paths, making leaps here and there, or rather, making here and there from leaps, shifting familiarly patterned practices, testing the waters of what might yet be/have been/could still have been, doing thought experiments with their very being.[4]

Thought experiments are material matters. Thinking has never been a disembodied or uniquely human activity. Stepping into the void, opening to possibilities, straying, going out of bounds, off the beaten path—diverging and touching down again, swerving and returning, not as consecutive moves but as experiments in in/determinacy. Spinning off in any old direction is neither theorizing nor viable; it loses the thread, the touch of entangled beings (be)coming together-apart. All life forms (including inanimate forms of liveliness) *do* theory. The idea is to do collaborative research, to be in touch, in ways that enable response-ability.[5]

Measurement is surely a form of touching. (Heisenberg got that part right.)[6] So are chemical reactions. Maxwell's demon, like every good experimentalist, would be lost if he or she did not have a highly developed sense of touch, a feel for the instruments and molecules at hand. ("Good hands," that's what it's called.) And touch engages us in a felt sense of *causality*, whether we generally acknowledge that or not, and whatever it is we may think of this charged and highly important term. Touch moves and affects what it effects.

In an important sense, touch is the primary concern of physics. Its entire history can be understood as a struggle to articulate what touch entails. How do particles sense one another? Through direct contact, an ether, action-at-a-distance forces, fields, the exchange of virtual particles? What does the exchange of energy entail? How is a change in motion effected? What is pressure? What is temperature? How does the eye see? How do lenses work? What are the different kinds of forces that particles experience? How many kinds are there? Once you start looking at it this way, you get a dizzying feeling as things shift. This particular take on physics, and its history, may entail a torquing, a perturbation from the usual storylines, but it is far from a gross distortion. I offer this twist on the usual framing as a provocation for opening up new ways of thinking about both physics and touch.

Inspired by the essays in this issue to stay in touch with the material-affective dimensions of doing and engaging science, and using this invitation to go out of bounds while staying in touch, in the remainder of this essay I explore the physics of touch in its physicality, its virtuality, its

affectivity, its e-motion-ality, whereby all pretense of being able to separate out the affective from the scientific dimensions of touching falls away.

Theorizing Touching / Touching Theorizing

Touch, for a physicist, is but an electromagnetic interaction.

A common explanation for the physics of touching is that one thing it does not involve is . . . well, touching. That is, there is no actual contact involved. You may think you are touching a coffee mug when you are about to raise it to your mouth, but your hand is not actually touching the mug. Sure, you can feel the smooth surface of the mug's exterior right where your fingers come into contact with it (or seem to), but what you are actually sensing is the electromagnetic repulsion between the electrons of the atoms that make up your fingers and those that make up the mug. Electrons are tiny negatively charged particles that surround the nuclei of atoms, and having the same charges they repel one another, much like powerful little magnets. As you decrease the distance between them the repulsive force increases. Try as you might, you cannot bring two electrons into direct contact with each other.

The reason the desk feels solid, or the cat's coat feels soft, or we can (even) hold coffee cups and one another's hands, is an effect of electromagnetic repulsion. All we really ever feel is the electromagnetic force, not the other whose touch we seek. Atoms are mostly empty space, and electrons, which lie at the farthest reaches of an atom, hinting at its perimeter, cannot bear direct contact. Electromagnetic repulsion: negatively charged particles communicating at a distance push each other away. That is the tale physics usually tells about touching. Repulsion at the core of attraction. See how far that story gets you with lovers. No wonder the romantic poets had had enough.

The quantum theory of touching is radically different from the classical explanation. Actually, it is radically queer, as we will see.

Quantum Field Theory: A Virtual Introduction

Quantum field theory allows for something radically new in the history of Western physics: the transience of matter's existence. No longer suspended in eternity, matter is born, lives, and dies. But even more than

that, 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. Quantum field theory, I will argue below, is a call, an alluring murmur from the insensible within the sensible to radically rework the nature of being and time. The insights of quantum field theory are crucial, but the philosophical terrain is rugged, slippery, and mostly unexplored.[7] The question is: How to proceed with exquisite care? We will need to be in and of the science, no way around it. Unfortunately, in the limited space I have here I can only lightly touch, really just barely graze, the surface.[8]

Quantum field theory differs from classical physics not only in its formalism but in its ontology. Classical physics inherits a Democretean ontology—only particles and the void—with one additional element: fields. Particles, fields, and the void are three separate elements in classical physics, whereas they are intra-related elements in quantum field theory. To take one instance, according to quantum field theory, particles are quanta of the fields. For example, the quantum of the electromagnetic field is a photon, the quantum of a gravitational field is a graviton, electrons are quanta of an electron field, and so on. Another feature is that something very profound happens to the relationship between particles and the void. I will continue to explain how this relationship is radically rethought in what follows. For now, I simply note, *pace* Democritus, that particles no longer take their place in the void; rather, they are constitutively entangled with it. As for the void, it is no longer vacuous. It is a living, breathing indeterminacy of non/being. The vacuum is a jubilant exploration of virtuality, where virtual particles—whose identifying characteristic is not rapidity (despite the common tale explaining that they are particles that go in and out of the vacuum faster than their existence can be detected) but, rather, indeterminacy—are having a field day performing experiments in being and time. That is, virtuality is a kind of thought experiment the world performs. Virtual particles do not traffic in a metaphysics of presence. They do not exist in space and time. They are ghostly non/existences that teeter on the edge of the infinitely fine blade between being and nonbeing. Admittedly, virtuality is difficult to grasp. Indeed, this is its very nature. To put it concisely, *virtual particles are quantized indeterminacies-in-action*.[9]

Troubling Matters: Infinities, Perversities, Hauntings

Physicists [. . .] took the vacuum as
something substantial [. . .] the scene
of wild activities.
—Cao and Schweber

When it comes to quantum field theory, it is not difficult to find trouble. It is not so much that trouble is around every corner; according to quantum field theory it inhabits us and we inhabit it, or rather, trouble inhabits everything and nothing—matter and the void.

How does quantum field theory understand the nature of the electron, or any other particle for that matter? It turns out that even the simplest particle, a point particle (devoid of structure) like the electron, causes all kinds of difficulties for quantum field theory. To be fair, one of the problems is already evident in classical field theory.

A bit of background on the electron. Immediately after its discovery in the nineteenth century, physicists did not assume that the electron was a point particle. They imagined it to be a tiny sphere. However, if you think of an electron as a tiny spherical entity with bits of negative charge distributed on its surface, and remember that like charges repel one another, then you can see the intractable difficulty that arises from this model: all the bits of negative charge distributed on the surface of the sphere repel one another, and since there is no positive (unlike) charge around to mitigate the mutual repulsion each bit feels, the electron's own electromagnetic self-energy would be too much to bear—it would blow itself apart. Such stability issues pointed to the need for a better understanding of the electron's structure.

In 1925, the Russian physicist Yakov Il'ich Frenkel offered a different proposal: the electron is a negatively charged point particle. That is, the electron has no substructure. In this way, he eliminated the difficulty of the mutual repulsion of bits of charges distributed on the surface because there were no bits of charge here and there, just a single point carrying a negative charge. But the attempt to push one instability away just produced another, for if the electron is a point particle (and therefore has zero radius), then the self-energy contribution—that is, the interaction of the particle with the surrounding electromagnetic field that *it* creates—is infinite. Frenkel believed that this paradox could only be resolved using quantum theory.

Not only did the infinities persist when quantum field theory tried to resolve the problem, they multiplied. Indeed, infinities are now accepted as an integral part of the theory: marks of self-interaction—the trace of the inseparability of particle and void. Specifically, the electron's self-energy takes the form of an electron exchanging a virtual photon (the quantum of the electromagnetic field) with itself. Richard Feynman, one of the key authors of quantum field theory, frames the difficulty in explicitly moral terms: "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!" (Feynman 115–16). Hence, the infinity associated with electron's self-energy, and other related infinities, wind up installed in quantum field theory as intrinsic "perversions."[10]

Apparently, touching oneself, or being touched by oneself—the ambiguity/undecidability/indeterminacy may itself be the key to the trouble—is not simply troubling but a *moral* violation, the very source of all the trouble. The electron is not merely causing trouble for us; in an important sense it is troubling itself, or rather, *its self*, as we will soon see. That is, the very notion of "itself," of identity, is radically queered. (Gender trouble for sure, but that isn't the half of it.) Then there is the question of whether what is really at issue is not touching oneself per se but rather the possibility of *touch touching itself*. The issue arises in quantum field theory in the following way: the electron emits a photon that "makes a positron-electron pair, and—again, if you'll hold your 'moral' objections—the electron and positron annihilate, creating a new photon that is ultimately absorbed by the electron" (Feynman 116–17).[11]

In fact, there is an infinite number of such possibilities, or what physicists also refer to as an infinite sum over all possible histories: the electron not only exchanges a virtual photon with itself, it is possible for that virtual photon to enjoy other intra-actions with itself—for example, it can vanish, turning itself into a virtual electron-positron pair whose terms subsequently annihilate each other before turning back into the virtual photon—before it is absorbed by the electron. And so on. This "and so on" is shorthand for an infinite set of possibilities involving every possible kind of interaction with every possible kind of virtual particle it can interact with.[12] That is, *there is a virtual exploration of every possibility*. And this infinite set of possibilities, or infinite sum of histories, entails a particle touching itself, and then that touching touching itself, and so on, ad infinitum. Every level of touch, then, is itself touched by all possible

others. Hence, *self-touching is an encounter with the infinite alterity of the self. Matter is an enfolding, an involution, it cannot help touching itself, and in this self-touching it comes in contact with the infinite alterity that it is.* Polymorphous perversity raised to an infinite power: talk about a queer intimacy! What is being called into question here is the very nature of the "self," and in terms of not just being but also time. That is, in an important sense, the self is dispersed/diffracted through time and being.

The "problem" of self-touching, especially self-touching the other, is a perversity of quantum field theory that goes far deeper than we can touch on here. The gist of it: this perversity that is at the root of an unwanted infinity, that threatens the very possibility of calculability, gets "renormalized" (obviously—should we expect anything less?!). How does this happen? It turns out that there are two different kinds of infinities/perversions involved. Most of the focus in quantum field theory is on the perversion of self-touching. But there is another that has to do with nakedness. In particular, there is an infinity associated with the "bare" point particle, that is, with the perverse assumption we started with that there is only an electron—the "undressed," "bare" electron—and the void.[13] Renormalization is the idea that the infinities cancel one another out: perversion eliminating perversion. The cancellation goes this way: The infinity of the "bare" point particle cancels the infinity associated with the "cloud" of virtual particles; in this way, the "bare" point particle is "dressed" by the vacuum contribution (that is, the cloud of virtual particles). The "dressed" electron, the physical electron, is thereby renormalized, that is, made "normal" (finite). (I am using technical language here!) Renormalization is the mathematical handling/taming of these infinities. That is, the infinities are "subtracted" from one another, yielding a finite answer.[14] Mathematically speaking, this is a tour de force. Conceptually, it is a queer theorist's delight. It shows that all of matter, matter in its "essence" (of course, that is precisely what is being troubled here), is a massive overlaying.

No doubt, the fact that this subtraction of two infinities can be handled in a systematic way that yields a finite value is no small achievement, and a very sophisticated mathematical machinery needed to be developed to make this possible. Nonetheless, whatever the attitude concerning the legitimacy or illegitimacy of renormalization, *the mathematical operation of subtraction does not effect a conceptual cancellation.* The infinities are not avoided; they are just handled. Philosophically, as well as mathematically, they need to be taken into account. Renormalization is a trace of physics' ongoing (self-)deconstruction: it continually finds

ways to open itself up to new possibilities, to iterative re(con)figurings. Perhaps the resurfacing of infinities is a sign that the theory is vibrant and alive, not "sick."

To summarize, quantum field theory radically deconstructs the classical ontology. Here are a few key points: the starting point ontology of particles and the void—a foundational reductionist essentialism—is undone by quantum field theory; physical particles are inseparable from the void, in particular from the virtual particles in the void, and the infinite plethora of alterities given by the play of quantum in/determinacies are constitutive inclusions in a radical un/doing of identity; and the unknown, the insensible, new realms of in/determinacy, which have incalculable effects on mattering, need to be acknowledged, or, even better, taken into account.[15]

All touching entails an infinite alterity, so that touching the Other is touching all Others, including the "self," and touching the "self" entails touching the strangers within. Even the smallest bits of matter are an unfathomable multitude. Each "individual" always already includes all possible intra-actions with "itself" through all the virtual Others, including those that are noncontemporaneous with "itself." That is, every finite being is always already threaded through with an infinite alterity diffracted through being and time.[16] Indeterminacy is an un/doing of identity that unsettles the very foundations of non/being. Together with Derrida, we might then say that "identity [. . .] can only affirm itself as identity to itself by opening itself to the hospitality of a difference from itself or of a difference with itself. Condition of the self, such a difference *from* and *with* itself would then be its very thing [. . .]: the stranger at home" (*Aporias* 10). "Individuals" are infinitely indebted to all others, where indebtedness is about not a debt that follows or results from a transaction but, rather, a debt that is the condition of possibility of giving/receiving. In a chapter of *On Touching—Jean-Luc Nancy* titled "To Self-Touch You," Derrida touches on, and troubles, the account Jean-Luc Nancy gives of sense as touching. He remarks that self-touching "in no way reduce[s] the alterity of the other who comes to inhabit the self-touching, or at least to haunt it, at least as much as it spectralizes any experience of 'touching the other'" (274).

Ontological indeterminacy, a radical openness, an infinity of possibilities, is at the core of mattering. How strange that indeterminacy, in its infinite openness, is the condition for the possibility of all structures in their dynamically reconfiguring in/stabilities. Matter in its iterative materialization is a dynamic play of in/determinacy. Matter is never a settled matter. It is always already radically open. Closure cannot be

secured when the conditions of im/possibilities and lived indeterminacies are integral, not supplementary, to what matter is.

Together with Haraway, we might ask: Whom and what do we touch when we touch electrons?[17] Or, rather, in decentering and deconstructing the "us" in the very act of touching (touching as intra-action), we might put the question this way: When electrons meet each other "halfway," when they intra-act with one another, when they touch one another, whom or what do they touch? In addition to all the various iteratively reconfiguring ways that electrons, indeed all material "entities," are entangled relations of becoming, there is also the fact that materiality "itself" is always already touched by and touching infinite configurations of possible others, other beings and times. *In an important sense, in a breathtakingly intimate sense, touching, sensing, is what matter does, or rather, what matter is: matter is condensations of response-ability. Touching is a matter of response. Each of "us" is constituted in response-ability. Each of "us" is constituted as responsible for the other, as the other.*

Justice-to-Come and the Inhumanity of Its Call

> Clearly, if we take quantum mechanics seriously as making a statement about the real world, then the demands it places on our conventional thinking are enormous. Hidden behind the discrete and independent objects of the sense world is an entangled realm, in which the simple notions of identity and locality no longer apply. We may not notice the intimate relationships common to that level of existence, but, regardless of our blindness to them, they persist. Events that appear to us as random may, in fact, be correlated with other events occurring elsewhere. Behind the indifference of the macroscopic world, "passion at a distance" knits everything together.
> —Greenstein and Zajonc

Touch is never pure or innocent. It is inseparable from the field of differential relations that constitute it. Like the essays in this special issue that are committed to exploring different scientific terrains while staying in touch with questions of justice, in this concluding section I want to bring this dimension of touch to the fore.

The infinite touch of nothingness is threaded through all being/becoming, a tangible indeterminacy that goes to the heart of matter. Matter is not only iteratively reconstituted through its various intra-actions, it is also infinitely and infinitesimally shot through with alterity. If the serious challenge, the really hard work, seemed to be taking account of constitutive exclusions, perhaps this awakening to the infinity of constitutive

inclusions—the in/determinacy, the virtuality that is a constitutive part of all finitude—calls us to a new sensibility.[18] How unfathomable is the task of taking account not only of mattering but of its inseparability from the void, including the infinite abundance that inhabits and surrounds all being?

For all our concerns with nonhumans as well as humans, there is, nonetheless, always something that drops out. But what if the point is not to widen the bounds of inclusion to let everyone and everything in? What if it takes sensing the abyss, the edges of the limits of "inclusion" and "exclusion" before the binary of inside/outside, inclusion/exclusion, mattering/not-mattering can be seriously troubled? What if it is only in facing *the inhuman—the indeterminate non/being non/becoming of mattering and not mattering*—that an ethics committed to the rupture of indifference can arise?[19] What if it is only in the encounter with the inhuman—the liminality of no/thingness—in all its liveliness, its conditions of im/possibility, that we can truly confront our inhumanity, that is, our actions lacking compassion? Perhaps it takes facing the inhuman within us before com-passion—suffering together with, participating with, feeling with, being moved by—can be lived. How would we feel if it is by way of the inhuman that we come to feel, to care, to respond?

Like some of the authors of the essays in this issue, I find myself experimenting with different narrative registers. Increasingly, I find myself drawn to poetics as a mode of expression, not in order to move away from thinking rigorously but, on the contrary, to lure us toward the possibilities of engaging the force of imagination in its materiality.[20] The force of imagination puts us in touch with the possibilities for sensing the insensible, the indeterminate, "that which travels along the edge of being, [that] is not being, but the opening of being toward" the other (Yusoff, "Insensible Worlds," n.p.).[21] Or rather, it brings us into an appreciation of, helps us touch, the imaginings of materiality itself in its ongoing thought experiments with being/becoming. To do this is to touch on an ethics that is alive to the virtual. Being in touch with the infinite in/determinacy at the heart of matter, the abundance of nothingness, the infinitude of the void that is threaded in, through, and around all spacetimemattering opens up the possibility of hearing the murmurings, the muted cries, the speaking silence of justice-to-come.

Troubling oneself, or rather, the "self," is at the root of caring (*OED*). Levinas makes trouble for the conventional notions of ethics by starting with, and staying with, this trouble. Derrida, citing Levinas, explains, "[R]esponsibility is not initially of myself or for myself" but is

"derived from the other" (Derrida qtd. in Kirkby 463). One can also hear reverberations of Levinas when the philosopher Alphonso Lingis writes: "Responsibility is coextensive with our sensibility; in our sensibility we are exposed to the outside, to the world's being, in such a way that we are bound to answer for it" (226). The sense of exposure to the other is crucial and so is the binding obligation that is our vulnerability, our openness, as Lingis reminds us. But what would it mean to acknowledge that responsibility extends to the insensible as well as the sensible, and that we are always already opened up to the other from the "inside" as well as the "outside"?[22]

Crucially, entanglements of spacetimemattering are threaded through and inseparable from the infinite alterity of the virtual.

> *Entanglements are relations of obligation—being bound to the other—enfolded traces of othering. Othering, the constitution of an "Other," entails an indebtedness to the "Other," who is irreducibly and materially bound to, threaded through, the "self"—a diffraction/dispersion of identity. "Otherness" is an entangled relation of difference (*différance*). Ethicality entails noncoincidence with oneself.*
>
> *Crucially, there is no getting away from ethics on this account of mattering. Ethics is an integral part of the diffraction (ongoing differentiating) patterns of worlding, not a superimposing of human values onto the ontology of the world (as if "fact" and "value" were radically other). The very nature of matter entails an exposure to the Other. Responsibility is not an obligation that the subject chooses but rather an incarnate relation that precedes the intentionality of consciousness. Responsibility is not a calculation to be performed. It is a relation always already integral to the world's ongoing intra-active becoming and not-becoming. It is an iterative (re)opening up to, an enabling of responsiveness. Not through the realisation of some existing possibility, but through the iterative reworking of im/possibility, an on-going rupture. (Barad, "Quantum Entanglements" 265)*

Ethicality entails hospitality to the stranger threaded through oneself and through all being and non/being.

I want to conclude this essay by making an attempt at putting "us" more intimately in touch with this infinite alterity that lives in,

around, and through us, by waking us up to the inhuman that therefore we are, to 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.* A cacophony of whispered screams, gasps, and cries, an infinite multitude of indeterminate beings diffracted through different spacetimes, the nothingness, is always already within us, or rather, it lives through us. We cannot shut it out, we cannot control it. We cannot block out the irrationality, the perversity, the madness we fear in the hopes of a more orderly world. But this does not mitigate our responsibility. On the contrary, it is what makes it possible. Indeterminacy is not a lack, a loss, but an affirmation, a celebration of the plentitude of nothingness.

I want to come back to Lingis's diffractive reading of Levinas, as itself diffractively read through the literary scholar Avivah Gottlieb Zornberg, in her book *The Murmuring Deep.*

> *[T]he murmur is the message: the background hum of life—desolate, excessive, neither language nor silence—is what links us to one another. What can be shared, for example, with the dying? Perhaps Lingis suggests, rather than transmitting clear meanings, the encounter rests on an acknowledgement of an elemental otherness that is related to our own: "We do not relate to the light, the earth, the air, and the warmth only with our individual sensibility and sensuality. We communicate to one another the light our eyes know, the ground that sustains our postures, and the air and the warmth with which we speak. We face one another as condensations of earth, light, air, and warmth, and orient one another in the elemental in a primary communication" [. . .].*
>
> *In an inspired reading of his materials, Frosh cites Žižek and Lingis, as well as Levinas and Agamben, to suggest that the ultimate communion between people rests in the capacity to draw on an elemental life that is experienced as inhuman. In this way, he argues, access to the murmuring deep, the inhuman aspect of human aliveness, sustains contact with the other. "Being 'in' a relationship with another is also a matter of being outside it, sharing in the impersonality that comes from being lived through by forces that constitute the human subject." (xxi–xxii)*[25]

How truly sublime the notion that it is the inhuman—that which most commonly marks humanity's inhumanity as a lack of compassion—that may be the very condition of possibility of feeling the suffering of the other, of literally being in touch with the other, of feeling the exchange of e-motion in the binding obligations of entanglements. That is, perhaps what we must face in thinking responsibility and justice is the existence of the inhuman as threaded through and lived through us, as enabling us, and every being/becoming, to reach out to the insensible otherness that we might otherwise never touch. The indeterminacy at the heart of being calls out to us to respond. Living compassionately, sharing in the suffering of the other, does not require anything like complete understanding (and might, in fact, necessitate the disruption of this very yearning). Rather, living compassionately requires recognizing and facing our responsibility to the infinitude of the other, welcoming the stranger whose very existence is the possibility of touching and being touched, who gifts us with both the ability to respond and the longing for justice-to-come.

I would like to thank Sophia Roosth, Astrid Schrader, and Elizabeth Weed for inviting a creative and provocative response to these essays. I am grateful to Lina Dib, Eva Hayward, Carla Hustak, Natasha Myers, Sophia Roosth, and Astrid Schrader for the lively provocations of their essays, which inspired this response. I am indebted to Fern Feldman for her patient reading and feedback on the essay, for her remarkable insights, and for the gift of her enthusiasm in discussing quantum field theory and other wild ideas over the years.

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Notes

1 The title of my essay here expresses my virtual engagements and entanglements with Derrida. I am indebted to Astrid Schrader and Vicki Kirby for putting me in touch with Derrida through their marvelous materialist readings of his work.

2 Touch has been an object of study for centuries, going back at least to Aristotle's momentous work on this topic. Part of what is at stake in this essay, and others in this issue, is joining with other feminist and postcolonial theorists in troubling the notion of touch as an innocent form of engagement and also, by implication, troubling its positioning in the history of philosophy as a mutually consenting act between individuals, free of culture, history, and politics. The literature on this is extensive. See, for example,

Ahmed and Stacey; Anzaldúa; Ball; Manning; Marks; and Puig de la Bellacasa.

3 Which is not to say that some theorists do not operate as if theorizing is a lofty enterprise that lifts the theorist above it all. My point here is that theorizing is as much a material practice as other kinds of practices, like experimenting, to which it is often counterposed.

4 The allusion to the making of spacetime through leaps, that is, through quantum dis/continuities, is discussed in more detail in Barad, "Quantum Entanglements." In that essay I explain my use of the slash to denote a dis/continuity—a cutting together-apart—of the terms in play (in the indeterminacy marked by their superposition).

5 See Schrader on response-ability as a kind of practice, including laboratory practices, that enables the organism or object of study to respond. By attending to the fine details of the science, by being *of* the science, doing the science justice, Schrader shows how incompatible laboratory findings (which have been the source of controversy in the scientific community) can in fact be reconciled by paying attention to the kinds and degrees of response-ability used in different laboratory practices.

6 All measurements are forms of touching. Heisenberg's uncertainty principle, once seen as the foundational principle of quantum physics, is at root an expression of the limits of human knowledge that result when a particle interacts with another in the processes of measurement. The uncertainty principle has now been replaced by the more fundamental notion of quantum entanglement, which is a contemporary expression of Bohr's "indeterminacy principle." According to the latter, measurements entail touch in the form of *intra-actions*, not interactions. See Barad, *Meeting*.

7 When there is talk of quantum physics, and especially when there is a consideration of its philosophical implications, the theory at issue, though it is usually not specified, is nonrelativistic quantum mechanics. Quantum field theory goes further, combining the insights of quantum mechanics, special relativity, and classical field theories. The philosophical implications of quantum field theory are much less explored. See, for example, Brown and Harré; Cao and Schweber; and Teller.

8 It has been my practice and my commitment to provide a sufficiently rich sense of the science that the reader can see how the storyline holds together even if there is not sufficient time or space to fully develop it. But here I can only offer a few hints of some key ideas. For more details, see Barad, "In/humanity." My current work, provisionally titled "Infinity, Nothingness, and Justice-to-Come," provides an in-depth explication.

9 For an accessible introductory treatment of quantum field theory, especially with regard to its understanding of the vacuum and virtuality, see Barad, *What Is the Measure of Nothingness?*

10 The moral fabric of the theory and the particles whose behaviors it purports to explain are widely questioned in quantum field theory. To offer a couple of additional examples, Kaiser takes note of common references to the "sickness" of quantum field theory and to the virtual particle as a "naughty schoolchild" (28–30).

11 According to quantum field theory, most kinds of particles have corresponding antiparticles, that is, particles with the same mass and opposite charge. For example, positrons are antimatter electrons. When positrons and electrons meet, they annihilate each other, producing photons. The reverse process can also occur: photons can turn into positron-electron pairs (or other kinds of particle-antiparticle pairs). Real particle interactions must conserve energy, but this is not the case for virtual particle interactions.

12 For example, in addition to virtual electron-positron pairs, it can interact with virtual muon-antimuon pairs, virtual quark-antiquark pairs, etc. The list of others is long. Additionally, there is an infinite number of ways to intra-act.

13 "Bare," "undressed," and "dressed" are part of the official technical language; I am not making up my own metaphorical terms to help make this more accessible. In technical language, the infinity I am talking about here refers to the bare parameters in the Lagrangian, or field, equations.

14 Actually, to put it this way is a bit of a fudge. The renormalized or redefined parameters (which replace the bare ones) are not calculable by the theory but, rather, are written in using the experimental values. This gives it the feel of a shell game no matter how mathematically sophisticated it is. Once the renormalized charge and mass are put into the theory, however, other kinds of quantities can theoretically be derived and compared with experimentation.

15 This last point refers to the "cut-off" that is part of the renormalization procedure. See esp. Barad, "In/humanity"; and Cao and Schweber.

16 Unfortunately, I do not have sufficient space to go into any detail concerning the mutually reciprocal, mutually constitutive indeterminacy of being and time. A few summary points might be helpful to the reader. There is no meaningful binary between being and becoming since time is not given. All being-becoming is always already a superposition of all possible histories involving all virtual others, where "histories" do not happen in time but, rather, are the indeterminate ma(r)kings of time. That is, the infinite alterity of being not merely includes others contemporaneous and non-contemporaneous with "its" time but also is always already open to remakings of temporality. Hence, all matter is always already a dynamic field of matterings. The play of quantum in/determinacies deconstructs not only the metaphysics of presence and the metaphysics of individualism but also anything like the possibility of separating them. The indeterminacies of being and time are together undone.

17 Haraway writes: "Whom and what do I touch when I touch my dog?" (35). See in particular her discussion of Jim's dog (5–8).

18 "Mattering is about the (contingent and temporary) becoming-determinate (and becoming-indeterminate) of *matter and meaning*, without fixity, without closure. The conditions of possibility of mattering are also conditions of impossibility: intra-actions necessarily entail constitutive exclusions, which constitute an irreducible openness" (Barad, "Quantum Entanglements"). Being accountable for phenomena necessarily entails

taking account of constitutive exclusions as part of accounting for the phenomenon. See Barad *Meeting* and "Quantum Entanglements."

19 The inhuman is not the same as the nonhuman. While the "nonhuman" is differentially (co-) constituted (together with the "human") through particular cuts, I think of the inhuman as an infinite intimacy that touches the very nature of touch, that which holds open the space of the liveliness of indeterminacies that bleed through the cuts and inhabit the between of particular entanglements.

20 Francis Bacon, the man who is credited with giving us the scientific method, concerned himself with these very issues of touch as the ultimate proposition and the effectivity of the force of imagination. In fact, he put the question of touch on science's docket, and the etymology of *contact* can be traced to his 1626 pronouncement: "The Desire of return into the Body; whereupon followeth that appetite of Contact and Conjunction" (qtd. in *OED*).

21 Yusoff's engagement with the insensible reverberates in interesting ways with some of the ideas presented here. I thank her for sharing a prepublication copy of "Insensible Worlds" with me.

22 Yusoff takes up this point in a different way.

23 This moving passage, which is very suggestive in light of the discussion here, speaks to the inherent inhumanness of the human, albeit with the human still very much at the center of the discussion. Note that the inhuman is being used in different ways by different authors.

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