

# Intra-active Entanglements

– An Interview with Karen Barad

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*This interview was conducted on a balcony, overlooking the Mediterranean Sea (with airplanes taking off and landing above our heads) during the Third International Symposium on Process Organization Studies, at Corfu, Greece in June 2011. The symposium had the theme “How Matter Matters: Objects, Artifacts and Materiality in Organization Studies”. We talked the day after Karen Barad had given the keynote “Ma(r)king Time: Material Entanglements and Re-memberings: Cutting Together-Apart”.*

**I:** *We would like to start off with a bit of biographical research trajectory. You were doing research as a physicist and somewhere along the way you connected your reading of Niels Bohr with feminist science studies and the work of Judith Butler, Michel Foucault and Donna Haraway in a very original way. So perhaps you can tell us how this evolved and how you became able to make these connections? It’s kind of a tricky question, I guess.*

[Laughs]

*Karen Barad:* Yes, it is. Autobiography. Hmm. Talk about constructing temporalities! How to tell a narrative of the trajectory of one’s thinking? A tricky starting point for a discussion in the wake of my keynote where I talked about dis/continuity (a queering of the continuity/discontinuity binary) and how matter in its intra-active liveliness unsettles terms like evolve, trajectory, biography, memory. Who is this “I” that would attempt to narrate my research

trajectory? Perhaps if you allow me to turn your question inside out, as it were, and ask: what material forces were contributing to the reiterative materialization of this “I”? Which political forces and texts that I was reading helped constitute “me”? (Of course, this is not to say that I can’t speak in the first person. After all the notion of an individual needs to be taken seriously – very seriously these days, because, for one thing, it is a very potent notion at the center of the action of neoliberal forces. At the same time, it’s crucial to raise the question of how ‘the individual’, including any particular individual, is iteratively (re)constituted.) Since there is no origin in this story, and no fixed narrative as such – in fact, Derrida might remind us that an autobiography is not a telling of a past that is present, but the ongoing openness of the narrative to future retellings (a point that resonates with insights from quantum theory as well), that is, it is a question of inheriting the future as well as the past – I will jump in and pull out a few threads in trying to honor your question. So there was a time, actually many times, as there still are, when I was reading all kinds of different things from different fields at once: physics, philosophy, science studies, feminist and queer theories, to name a few of my many debts. (Admittedly this is a rather unusual anti-disciplinary omnivorous reading practice for someone with a career in physics, who grew up in the northeastern part of the US, just at the tail end of baby boom, postwar, post-Sputnik, a working-class second-generation American who was the first in my family to go to college, without any expectation of being an academic. My boundary-crossing and indeterminate ways of being have never allowed me to fit any academic space comfortably. I remember mentioning Derrida at a lunch with my physics colleagues at Colombia in the mid-80s. It was immediately evident that I had committed the ultimate faux pas, and that in any case no one had any idea what I was talking

about. So much for C.P. Snow.) Anyway, it struck me that the theories of Foucault and Butler would be very helpful in further elaborating Bohr’s amazing insights concerning the materiality of discursive practices (or at least that’s the agential realist way of putting it), because it’s quite clear that in articulating his notion of apparatus Bohr gestures in a direction that is very much about the social, and yet he does not offer any theoretical understanding of it. For all its importance, Bohr’s notion of the apparatus is remarkably thin. In fact, the apparatus is just kind of there, in a kind of static form. Bohr drafted very detailed diagrams of apparatuses that he pointed to in explaining his philosophy-physics. They are beautifully detailed in ways that demonstrate just how and why the actual materiality of the apparatus is constitutive of the phenomenon. So the details are absolutely crucial, and of course, indicative of the way in which *concepts* for him are materially instantiated in the apparatus. Or rather, that concepts are specific material configurations, so the details of the apparatus – like the bolts fixing one part of the apparatus to another, or springs that enable parts of the apparatus to move and be responsive – are of fundamental importance. And yet, with all of that detail we just have this apparatus that’s operating itself – there’s nobody on the scene building the apparatus, there is no reconfiguring of the apparatus, tweaking it, and all the various practices of getting the apparatus to work. Of course, laboratory practices are social practices with particular epistemological stakes. So I looked to social and political theory for a thicker sense of the social to diffractively read through Bohr’s insights. These had to be not only very rich insights concerning social forces and the natural-cultural constitution of the subject, but very importantly, I needed something that would be, if not on first encounter coherent with the ontology that I was developing in reading Bohr, at least something that I could use that sug-

gested a certain consistency in opening the way to further elaboration. And so, I needed to find some understanding of subjectivity, the social, and power, that would be in line with my performative understanding of what Bohr was doing. And so at that time I was reading Foucault and Butler and so on and that just seemed really rich to me, and really important. So while science studies underlined the importance of a more dynamic sense of the apparatus, it was important to me to incorporate feminist and queer work on subjectivities and on power, because as every physicist worth her salt knows from the famous theorem of Emily Noether, symmetries do not just appear, rather they are indicative of underlying conservation laws and it is therefore crucial to examine the forces at work, and so I didn't want to simply postulate some built-in symmetry of the human and nonhuman. What was needed was to have a more complex topology than a kind of level playing field of objects and subjects. Not a parliament of things but a kind of questioning and unsettling of representationalist politics that was very much alive in feminist work at the time and still is. So performative understandings of gender and so on were really key to walking along with and moving Bohr along in a way that enriches his provocative understanding of the material-conceptual nature of apparatus and its role in the co-constitution of objects and subjects, while drawing out and further developing crucial ontological insights. But having pulled out this particular thread, it's important to emphasize the dynamic and reiterative reworking of Foucault and Butler that was necessary as well. Here I am referring to the method of diffractively reading insights through one another for patterns of constructive and deconstructive interference. What I mean is that the insights I found in Bohr were likewise crucial to further elaborating feminist and queer understandings of world-making where humans and nonhumans and the divide between

them are not hard-wired into political analyses. Which brings me back to my indebtedness to feminist science studies, and the work of my dear friend and colleague Donna Haraway, most especially. Donna and I have been in conversation with one another for decades and I have learned an enormous amount from her. Joe Rouse has also been a very important philosophical companion over the years. And many others as well. Inheritance and indebtedness are not only the substance of any particular autobiographical story, but it is something that also goes to the core of the ontology (or rather ethico-epistem-ontology) of agential realism: phenomena do not occur at some particular moment in time; phenomena are specific ongoing reconfigurings of spacetime-mattering. I doubt I have done justice to any of that here, and so the impulse is to reiteratively rework this story even before I finish responding, but of course, there is no such terminus as such.

*I: Your work has been classified as part of the material turn within feminist research and theories. In the call for papers for this special issue of Women, Gender & Research on Feminist Materialisms, we have re-configured this framing somewhat. We write that we are not eager to canonize a “new materialist turn” or “feminist material turn”, in opposition to other “turns”, and that we conceive your work as transgressive and building on/connecting with as well the alleged ‘material turn’ the ‘linguistic turn’, the ‘spatial turn’, the turn to the body and even the ‘affective turn’. What do you think about the discussions around “the material turn” and the positioning of your work?*

*Karen Barad:* Thank you for this reconfiguration, one I resonate with very much. If “turning” indicates “swerving off course” that’s one thing, but if it is meant to indicate a “turning away from” or “moving beyond”, a sense of getting on with it and leaving the past behind – that’s not how I

understand my own project. Diffraction, both as methodology and as physical phenomenon, does not traffic in a temporality of the new as a supercessionary break with the old. On the contrary, diffraction is a matter of inheritance and indebtedness to the past as well as the future. The quantum eraser experiment that I discussed in my keynote goes right to this issue. Think about the temporality of “moving beyond” – that’s a temporality that forgets that we’re always already haunted by the past and the future – that neither the past nor the future is closed. Closure can’t be secured when the conditions of im/possibilities and lived indeterminacies are integral, not supplementary, to what matter is. I’m suspicious of the current fascination with the new, which dovetails all too well with late capitalism’s voracious appetite for the new (even in its appropriative repackaging of the old, the nostalgic, as a new/trademarkable past). So the engagement for me entails a different ethics than one that presumes that we get to reset time, erase the past, cancel our debts, and start anew with the new. I see my work as being very much indebted to rich histories of materialist thinking (some of which I’ve studied and draw from directly, others that reverberate with my own thinking that I haven’t had time to sufficiently study, as well as other ideas-to-come, those yet to be studied, and no doubt others too that are materially entangled with my own thinking without my being aware of it). But this is precisely what is intended, I think, in the designation “new materialisms” that some have suggested – not a breaking with the past, but rather a dis/continuity, a cutting together-apart with a very rich history of feminist engagements with materialism. (This is not the case with some other approaches that are being put forward as self-proclaimed “movements” that don’t see themselves as necessarily allied with feminism, queer studies, postcolonial studies, etc., that fancy themselves as having no debts and no past,

a clean break of ideas. But I don’t see this is the case with new materialisms. There is a tension held in using ‘new’ as an adjective, a reference to multiple temporalities, otherwise why reference ‘materialism’ at all? New materialisms are of course deeply indebted to Marx, and to others indebted to Marxism, including Foucault and a generation of feminist engagements with Marxist insights that travel under the names “materialist feminisms”, “feminist science studies”, to name a few.) This point about dis/continuities and cutting together-apart brings me again to the notion of diffraction, to a very important aspect of it. Diffraction as a physical phenomenon is acutely sensitive to details; small differences can matter enormously. As I discussed in *Meeting the Universe Halfway*, diffractive readings must therefore entail close respectful responsive and response-able (enabling response) attention to the details of a text; that is, it is important to try *to do justice* to a text. It is about taking what you find inventive and trying to work carefully with the details of patterns of thinking (in their very materiality) that might take you somewhere interesting that you never would have predicted. It’s about working reiteratively, reworking the spacetime-mattering of thought patterns; not about leaving behind or turning away from. (And surely not about making a caricature of someone’s work and knocking it down, which unfortunately has been a form on engagement in some objections to “new materialist feminisms”. Caricaturing does epistemological damage: when epistemological care is not exercised there is an unfortunate and unhelpful obscuring of the patterns of difference, and in this case, the obscuring of crucial issues regarding the deconstruction of binaries.) I think that “turning away from” is the wrong ethics so that’s why I really liked the way that you framed this and thank you for bringing that awareness to this discussion. As Maria Puig de la Bellacasa puts it, what is needed is not only at-

tion to matters of fact, or even matters of concern – but also, matters of care.<sup>2</sup> I agree with Latour that critique has run out of steam – it’s too formulaic, too predictable.<sup>3</sup> Also, very importantly, it forgets the necessary mutual exclusions that are constitutive of phenomena, and buys into and enacts a linear temporality that closes down rather than opens up what is to come. Critique may provide some important insights at first glance, but critique isn’t an acceptable stopping point of analysis. It isn’t sufficient, and often times it isn’t at all helpful politically. The presumed exterior and oftentimes superior positionality of critique doesn’t have the kind of political traction that is so needed.

*I: How do you see the relationship between feminist science studies and critical engagement?*

*Karen Barad:* I remember being very troubled in the formative years of feminist science studies by the naming of the nascent field “feminist critiques of science”. As a scientist living in science worlds it was crystal clear that this naming was really unhelpful if one was interested in dialoguing with and working with scientists. The notion of critique helps itself to a particular spatiality, as well as temporality: one of separateness and exteriority. The idea that critique is from the outside, outside of science, for example, was really problematic both in terms of having thick understandings of science, and productive engagements with scientists. I can appreciate the political impulse. Feminists were attuned to the ways in which globalizing (“Western”) science has a history (and a present) of excluding women, people of color, people from the global south, and a host of indigenous Others. And admittedly there’s also a history of close relations between science and the militarism, capitalism, colonialism, and so on. These are important pieces, today as well as in the past, but a whole-cloth rejection of

the scientific enterprise based on essentialist claims about what it is and has been, as if there’s some unity in what goes under the name science, is not a helpful opening for working together. And collaboration is precisely what’s needed for the responsible practice of science. In my own work I have tried to engage constructively and deconstructively (not destructively) with science, where deconstruction is not about taking things apart in order to take them down, but on the contrary, about examining the foundations of certain concepts and ideas, seeing how contingency operates to secure the “foundations” of concepts we cannot live without, and using that contingency to open up other possible meanings/matterings. And so, there was a moment when a few of us who long/ed for what we might call the “responsible practices of science”, pushed to rename the field “feminist science studies”, in an effort to open up and welcome other forms of engagement. Admittedly, this naming has short-comings as well. One draw-back has been that people think that feminist science studies is a kind of subset of mainstream science studies that focuses on women and gender issues, and that’s really unfortunate. But it has also opened up the possibility of spaces of engagement that otherwise would have been closed.

*I: How do you try to create those spaces of collaboration and engagement in your own work?*

*Karen Barad:* At UCSC (University of California, Santa Cruz) we have created a Science & Justice Working Group and an associated graduate training program, forums that work collaboratively to address issues of science and justice. These efforts entail building communities of trust across academic divides. In particular, it involves building trust with scientists of good will, scientists who care deeply about using science for purposes of mutual flourishing, but may

not have an idea about how to think through the ethics and justice issues. My colleague Jenny Reardon has taken the organizational lead in these efforts, and Donna Haraway and I have been major contributors from the outset. I think the fact that the three of us have an abiding love of science (a mature love that sees both its warts and its potential) and are committed to working across field differences and other kinds of differences has been very important to the success of these programs. We have ongoing support and participation from students, faculty, and staff from all five university divisions (natural sciences, engineering, arts, humanities, and social sciences). This may seem like an awesome accomplishment and in some ways it is, but it must also be acknowledged that we have benefitted from an opening that has been produced by a range of historical and political factors. Postwar science education in the US has made use of a science-as-steward or science-as-savior imaginary to attract students to careers in science. It doesn't take much to bring out the colonialist, paternalist, and capitalist underbelly of this; at the same time, this imaginary has served to attract a sizeable population of scientists who have embraced careers in science and technology with the explicit purpose of helping to make a better world. Despite the fact that the education of a scientist doesn't include the knowledge and skill base needed to think through all the complexities that must be understood in order for the utopian promise to operate in ways that actually move us towards a more just world, rather than away from it, scientists are now required by government funding agencies to consider the ethical implications of their proposed project, and many of them want to take this part seriously but realize they just don't know how to think it through. So despite this gap in the education of a scientist (to say nothing of corresponding gaps in scientific understanding that those without scientific training wind up having),

the commitment – wanting to practice science responsibly – is a serious entry point, a welcome opening, an invitation. In fact, in our experience there is a substantial upsurge in interest in science and justice issues among scientists. Young people especially are coming to us saying we care about how the science we do affects the world but we don't know how to think this through. So we encourage them to join the conversation. One of the most important things we offer in the training program is a deep appreciation of the entanglements of facts and values: the notion that values as well as facts are being “cooked” together at the lab bench. That's why the new training in bioethics is often an approach that falls short – being called on to specific use guidelines after the science is done is too little, too late. So we take a very different approach, one deeply informed by feminist science studies. It's really great to see so many young scientists interested in trying to figure out how to go about asking the important ethical and social justice questions. The ethical question can't simply be about informed consent, a notion that is rooted in a metaphysics of individualism. And by the way, when I say “ethics” I don't mean moralizing and so on and so forth, but rather an understanding of how values matter and get materialized, and the interconnectedness of ethics, ontology, and epistemology. What we're striving for is helping students form collaborations to think and work together to take into account questions of social justice as an integral part of doing good science. If phenomena, not things, are the objective referent then the apparatus that produces data and things also produces values and meanings. The students learn to think in more sophisticated ways about apparatuses as laboratory practices. Matters of fact are not produced in isolation from meanings and values. This is an ethico-onto-epistemological issue. Ethical considerations can't take place after the facts are settled, after the re-

search is done. This is the wrong temporality. Values and facts are cooked together as part of one brew.

We have been building a really remarkable and diverse community, held together by our shared commitment to help make a more sustainable livable world for mutual flourishing. We flourish as a group by honoring our differences, respectfully disagreeing, and working collaboratively with and through our differences. This is hard work, sometimes fun and sometimes painful. It's not utopic, but it's a collaborative alliance with traction. This kind of traction doesn't arise out of critique. Critique makes people feel attacked. It doesn't focus on living together, hopefully living well together and flourishing. Developing diffraction as a methodology for me has been about that ethico-onto-epistemological engagement, attending to differences and matters of care in all their detail in order to creatively re-pattern world-making practices with an eye to our indebtedness to the past and the future. Diffraction is about thinking with and through differences rather than pushing off of or away from and solidifying difference as less than. I have taken to using the term trans/materialities, a term I offered up in my talk to signal material intra-relatings and differences across, among, and between genders, species, spaces, knowledges, sexualities, subjectivities, and temporalities. But in any case, creativity is not about crafting the new through a radical break with the past. It's a matter of dis/continuity, neither continuous nor discontinuous in the usual sense. It seems to me that it's important to have some kind of way of thinking about change that doesn't presume there's either more of the same or a radical break. Dis/continuity is a cutting together-apart (one move) that doesn't deny creativity and innovation but understands its indebtedness and entanglements to the past and the future.

*I: Talking about theory and politics we can maybe take the example of Monica Casper's*

*work on fetal surgery that you engage with to further elaborate on this issue. In a critical comment to the discussion on the symmetry between humans and non-humans in actor-network theory in the 90s, Casper warns that constructions of active fetal agency may render pregnant woman invisible as human actors. On this basis she argues that feminists have to take strategic and political stance to who or what you grant agency.<sup>4</sup>*

*Karen Barad:* I love Monica's instinct here. At a particular moment in the discussions of actor-network theory when the symmetry between humans and nonhumans elided crucial questions of power and agency, and what dropped out was any robust understanding of power regarding the differential co-constitution of humans and nonhumans, Monica had her finger on the pulse of a real difficulty with this symmetry. This difficulty, I imagine, was made particularly poignant for her in her study of fetal surgery: the granting of agency all around led straight to political difficulties in the granting of agency to fetuses via practices that constituted the fetus as a patient, sometimes with interests opposed to that of the pregnant woman, and in ways that contribute to anti-abortion discourse. That's where I see her trying to make an intervention, and I think that's exactly the right instinct. And I was very inspired by that, but her answer I thought was a bit too quick. Because I think about midwife assisted births, and I think about the way in which fetal agency is so crucial to many kinds of birthing practices, and also other particular kinds of geopolitical practices where the fetus (particularly devalued "girl" fetuses) must be brought into the picture of what matters. What happens to our ability to engage in practices of feminist analysis if one draws a universal boundary, a cut that goes all the way through and applies everywhere for all time, that says who should and who shouldn't be granted agency? In fact, there's a deeper issue here, the very idea of

the “granting” of agency. The irony of this move should not escape our attention. What kind of move is that to grant agency to other beings? – that’s giving with one hand and taking it back with the other, all as one move. Monica’s wonderful work on fetal surgery teaches us how important the attribution of fetal subjectivity is. So if what is really important is the attribution of subjectivity, rather than agency, then perhaps what needs rethinking is the presumed alignment of subjectivity and agency, and the notion that agency is something someone has. So agency is for me not a matter of something somebody has but it’s a doing, it’s the very possibilities for reworking and opening up new possibilities, for reconfiguring the apparatuses of bodily reproduction.

*I: Your answer here concerning agentiality is, of course, rooted in your theorizing, and we find that quantum physics is crucial in your work and theorizing and you also show that in your talk yesterday. I loved that. But it seems that this dimension is predominantly left out or hasn’t yet entered – or whatever framing one may do on that – the ways that your work has been taken up in and out of feminist studies, so we would like to turn to an engagement with these thoughts.*

*Karen Barad:* I really appreciate that you notice that. I think there are so many wonderfully queer twists that spring from quantum physics that could be very useful to feminists but have been given little attention.

*I: In what ways do you find that quantum physics and your agential realist reworking of it is important and fruitful in social theorizing and feminist thinking? And what does it open up that other theorizations of non-linear temporality and relational space etc. does not already?*

*Karen Barad:* Before I even begin to answer your wonderful question I want to ad-

dress an issue that so often gets in the way. It has to do with two key misunderstandings: one is that I am suggesting/endorsing/practicing applying quantum physics to the social world by drawing analogies between tiny particles and people, and the other is a related confusion that there are two worlds – one microscopic and the other macroscopic. Unfortunately, the analogical approach has been somewhat of a favorite and the results have not been very fruitful. I have the same cringe reaction to many of these that my physics colleagues have. I have not only explicitly warned against this approach but I have spelled out why I think it is not very productive, or at least very limited in what it can offer. Instead of drawing analogies, my method has been to examine the underlying metaphysical assumptions and to understand and elaborate the philosophical structure of the theory. Also, another reason you wouldn’t catch me drawing analogies between the two domains because I question this very idea that there are separate domains of existence. This brings me to the second misconception. There is the persistent misconception that quantum physics, not only its equations but also its interpretative structure, including its ontological and epistemological implications, is irrelevant for anything ‘macroscopic’. That is, there’s a persistent belief that whatever peculiarities exist in the microworld (for example, a relational ontology and all that implies), they don’t exist in the macroworld. In other words, some hold fast to the belief that the world is separated into two independent domains – micro and macro with quantum physics governing the behavior of micro-objects and classical physics governing the behavior of macro-objects (as if both theories are fundamental rather than understanding that classical physics is just a good approximation to quantum physics for large mass objects.). It’s a belief that suggests that at a particular scale, one conveniently accessible to the human, a rupture exists in



the physics and ontology of the world, as if there's a seam or impenetrable wall down the middle. According to this story, particles and other microscopic objects are singularly exotic Others, whereas baseballs and rockets and all matter of everyday things are as American as apple pie, if you'll forgive the expression, that is, strictly normal. In this way, all queerness is restricted to the subhuman level. Out of sight, out of mind. Normalcy is thus safeguarded by the micro/macro distinction, and any danger of infection or contamination of any kind is removed in this strict quarantining of all queer Others. And I might add that I do mean "queer" in the sense we use it today, not simply strange. There's quite a bit to be said here, and I've discussed this in written work, but for now we might keep this in mind: *Queer* is a radical questioning of identity and binaries, and quantum physics, like queerness, displaces a host of deeply-held foundational dualisms. One could say that this denial of quotidian queerness of the world is a kind of queer-phobia. (Which is not to say that the new-age embrace of everything quantum is a celebration of the queer either, because what is being embraced is not quantum queerness whatsoever, but often a neoliberal individualist appropriation of one or another caricatures of quantum physics, where there's a complete reversal of the two domain belief, and a total elision of how scale matters. I want to emphasize that I'm not saying that scale doesn't matter, not at all – although the way scales are produced has to be part of the conversation – but rather, that it is a particular kind of assumption at play in insisting there are different ontologies and laws of physics in different domains.) At the same time, I should perhaps quickly add another cautionary comment, particularly for the benefit of my physics colleagues and others who may not be accustomed to this type of analysis. I am *not* saying that those who hold the view that there is a determinate boundary between the mi-

croworld which is governed by quantum physics, and the macroworld which is governed by classical physics, are queer-phobic. What I am saying is that one needs to examine the impulse to contain the queer behaviors that characterize the "quantum world" to be limited to a subhuman "realm". Why should we find the metaphysical individualism of classical physical so "natural" in its obvious applicability to human phenomena, while refusing to consider the possibility that the nonrelational ontology of quantum physics might yield a different set of insights worth considering about human and nonhuman worlds, and the ways that boundary gets made and enforced? Notice that what I'm suggesting here is a shift in the ontological and epistemological underpinnings of our theories, not an insistence that quantum physics can provide an explanation for everything under the sun – as if this were some new theory of everything. Quantum physics profoundly disrupts many classical ontological and epistemological notions what we take for granted, and delving into the details of this disruption can open up exciting realms of thought. I am sympathetic to my physics colleagues' strong reactions against the all-too-familiar approach of drawing simplistic analogies between the way things happen in the "micro" world and in the "macro" world, or even more egregious the flat-footed applications of (some aspects of some) quantum ideas to human phenomena in all kinds of efforts to give scientific justification for every nonintuitive belief under the sun. I get that. And yet, the insistence on keeping these physics insights "where they belong" is an idea that displays its own ignorance in not appreciating the always-already historical entanglement of discourses of scientific, religious, philosophical, economic, geopolitical, and other ways of knowing and knowledge practices. But I also have to say that many physicists are in fact open to these ideas, while many nonscientists hold fast to this misconcep-

tion and the associated disciplinary practices that split the world into separate ontological domains. So it's important to understand what we're talking about when we talk about the ontology or epistemology of quantum physics, especially as appreciated in their inter-implication. It is not at all evident, given the empirical investigations to date, that the ontology of quantum physics is restricted to the very small. In fact, part of what follows from the relational agential realist ontology I've proposed is the fact that scale is one of the features that gets produced as part of this ongoing reconfiguring of spacetime-mattering.

Sorry to take so long with the preliminaries but they are so often in the way. Now, when it comes to addressing your questions about innovative thinking that quantum physics opens up, there are many things that I could talk about, but just to pick up on a theme from my talk, that I already mentioned briefly, is the question of dis/continuity (where the slash is indicating an active and reiterative (intra-active) rethinking of the binary). The notion of a quantum leap is something that has been underappreciated and undertheorized. Quantum leaps are not simply strange because a particle moves discontinuously from one place here now to another place there then, but the fundamental notions of trajectory, movement, space, time, and causality are called into question. And the here and there and now and then are not separate coordinates, but entangled reconfigurings of spacetime-mattering. (I talked about this in detail in my paper in *Derrida Today*.<sup>5</sup>) Dis/continuity is neither continuous with discontinuity nor discontinuous with continuity. The assumption that there is a strict dichotomy between continuity and discontinuity has been a very persistent belief. It is one of the few binaries that is seldom questioned, even when the discussion is about space, or time, or matter, and how we shouldn't take them for granted. A quantum dis/continuity cuts troubles the

very nature of dichotomy – cutting into two. Cuts are matters of cutting together-apart. The very notion of the cut is cross-cut. Quantum dis/continuity is an un/doing, even un/doing itself and the notion of 'itself'. Even it's double naming – 'quantum' 'discontinuity' – suggests the paradoxical notion of a rupture of the discontinuous, a disrupted disruption, a cut that is itself cross-cut. I find it a real mind buzz to contemplate how quantum physics calls into question not only particular binaries but the very notion of a binary. The cut is reiteratively cut through, cross-cutting the cutting, reiteratively reconfiguring thought/doing/matter/meaning without end.

Dis/continuity is at the core of what I call agential separability. Agential separability is a notion that cuts across the separate/not separate binary. Agential separability is hugely important. It not only provides important insights for physics (like its usefulness in solving the so-called "measurement problem"), but also questions concerning the nature of relationality more generally. I highly recommend Chapter 7 of *Meeting* where there is an in-depth discussion of agential separability. Chapter 7 is a favorite among physicists, but there is much more going on than physics alone (whatever that means). In fact, it's very relevant in thinking about social and the political theory, and questions of ethics and social justice.

I: *It seems to me that agential separability is closely connected to your notion "cutting together apart" and lies at the core of understanding how quantum physics dissolves the very notion of a binary?*

*Karen Barad:* Yes. This is another quantum gem. Cutting together-apart (one move) involves a very unusual knife or pair of scissors! Classical physics assumes a Cartesian cut, an absolute a priori distinction, between subject and object. Bohr understood that this cut did not precede measurement

interactions but was rather produced by them. In my agential realist elaboration of Bohr, the dynamics is based on intra-actions, not interactions, and the cut is intra-actively enacted. “Cutting together-apart” entails the enactment of an agential cut together with the entanglement of what’s on “either side” of the cut since these are produced in one move. This notion has become indispensable for me in thinking about questions of indebtedness, inheritance, memory, and responsibility.

Suppose we consider the quantum eraser experiment. It’s ironic that the quantum eraser experiment – which experimentally confirmed Bohr’s notion of complementary (his indeterminacy principle) as more foundational than Heisenberg’s uncertainty principle, giving support to my reading of his implicit ontology and the fact that entanglements are actual configurations of the world, not simply epistemological connections – was at first interpreted by physicists according to a classical way of thinking about things. Even the very naming of this experiment, the quantum *eraser* experiment says so much about a very particular way of interpreting the experimental results. According to the interpretation that was first given, when the experimenter destroys information concerning an event that has already happened (like information concerning which slit a particle goes through), the original result that existed prior to the information-gathering event (in this case a diffraction pattern that was manifest before the which-slit information was obtained) is said to have been “recovered”. This suggests that we can erase events and their effects, after they occur. Now there’s no doubt that the quantum eraser experiments are remarkable, really extraordinary in their implications. But an interpretation that understands these events in terms of erasure and recovery seems to me to itself be based on a kind of erasure – the erasure of the work of tracing entanglements – of the responsibility of being bound by, of being

obligated to the bodies that are marked by these encounters. It speaks of a politics of hope for erasing events that we regret, as if they could be removed at will. It’s a hope for a temporality of resurrection, of starting time anew, starting over, wiping the slate clean, and not honoring and not being accountable to what has already happened. The ghosts of the Manhattan project and the dropping of the bomb on Hiroshima and Nagasaki surely haunt this kind of wishful thinking. (Again, I am not making a claim here about intentions or wishful thinking on the part of individual physicists, but rather bringing out some of the foundational assumptions that work beneath the surface in a stealth manner, and remain unacknowledged, precisely because they work so happily with particular societal beliefs and hopes.) But erasure of past events is not what’s going on in the experiment. If you really attend to the data in terms of phenomena (as opposed to things, and this very shift is in fact confirmed loud and clear *by this very experiment*), you see that the diffraction pattern only shows up again if you do the work of tracing the entanglements. In performing the labor of tracing the entanglements, of making connections visible, you’re making our obligations and debts visible, as part of what it might mean to reconfigure relations of spacetime-mattering. So spacetime-mattering can be reconfigured in a way that reopens the past, in fact it happens all the time whether or not it’s something that we directly observe under specific experimental conditions. But what it says then is that, what is at issue is not the *erasure of events*, but *reconfigurings of spacetime-mattering*. Indeed, it shows that the universe itself holds a memory of each event – the fact that the first the particle goes through one slit or the other of the which-slit apparatus, and then after it hits the screen, the which-slit information is destroyed, and then the pattern on the screen is reconfigured and reanalyzed ... all of this is on record. Or to

put it a bit more precisely, the universe does not have memory, it is the memory of iterative materializations. This suggests that there's a sense in which even molecules and particles remember what has happened to them. The inanimate is always being shoved to the side, as if it is too far removed from the human to matter, but that which we call inanimate is still very much bodily and lively. It may seem perverse, unimportant, or meaningless, to attribute memory to an inanimate happening, but that speaks of a failure of imagination that gets stuck at the threshold of one of the most stubborn of all dualisms – the animate/inanimate dualism – that stops animacy cold in its tracks, leaving rocks, molecules, particles, and other inorganic entities on the other side of death, of the side of those who are denied even the ability to die, despite the fact that particles have finite lifetimes. Who gets to count as one who has the ability to die? A rock, a river, a cloud, the atmosphere, the earth? How about viruses, brittlestars and other boundary-crossers? What about the fate of carbon and phosphorous? And if these concerns sound silly, why? And I don't mean some kind of strategic vitalism or the welcoming of the other into representationalist forms of democracy in order to get people to pay attention to "the environment". This is about boundary drawing practices and how they matter, and who and what gets to matter. For some time now we have been entranced by the biological and we have focused on it to the exclusion of chemical, geological, and physical forms or aspects of life. Feminist research has taken the biological body to stand in for all bodies, for "the body". What are the effects of the constitutive exclusion of bodies that get placed on the other side of life, of liveliness, those that aren't worthy of death, those that don't measure up when it comes to death? What is at stake in securing this dualism and how does its persistence matter?

Now the results of the quantum "eraser"

experiment are very profound. For what it does suggest is the fact that the past is not closed, that temporality is not given or fixed, that each materialization in its specificity is re-membered, and that responsibility is about putting in the work to trace worldly entanglements, including all due attention to our debts and obligations. In other words, each meeting matters, not just for what comes to matter but what is constitutively excluded from mattering in order for particular materializations to occur. In some cases, a remediative response may be important, but it must be remembered that remediation does not constitute an undoing of loss and the recovery of some prior state of existence, as if the clock could be turned back to an earlier time (for example, before the bomb was dropped). There is no past that is simply still there that we can go back to, some unadulterated moment in time that is forever more awaiting some time traveler to drop by. This may seem obvious on the face of it, but it undergirds certain kinds of thinking, even public policy in ways that we may not notice.

I: *Can you give an example of this?*

*Karen Barad:* Yes. Alex Mufson, an extraordinary undergraduate student who took some classes with me, worked with agential realism to think about questions of temporality and justice associated with the "reintroduction" of the wolf (but not the wolf that was!) into Yellowstone National Park – a "restoration" project with significant scientific, political, practical, and social justice issues at stake. Alex argued that the romantic desire to return the world to some "lost natural state" is an illusion that has not served conservation efforts well. Not only is there no pristine time that can be returned to, no identical "environment" to reinsert wolves into, but the wolf that once roamed Yellowstone, before it was systematically killed off, no longer exists; in fact, the wolves that were "re"-introduced into

the park were an entirely different species, and even if they were the “same” species, they would now have different material histories. This is not a general statement against restoration efforts and the like, but it says that all the “re’s”, like “restoration”, “reintroduction”, “rehabilitation”, “remediation” must be taken as questions, not answers, and in doing so policy makers need to confront the questions of agency and responsibility, the violence of all cuts (including “restorative” ones), and their constitutive entanglements, with all the associated ethical, epistemological, and ontological implications of the reconfigurings of spacetime mattering. These are questions of reiteration, which is not about recurrence or reproduction of the same; on the contrary, reiteration is about the *différance* of intra-activity, the reconfiguring of conditions of im/possibility. There are also other issues that come to the fore. For one thing, responsibility and accountability to/for phenomena are crucial ethico-epistem-ontological matters, where responsibility, is not about a calculable system of accounting, but about hospitality as Derrida would have it, about inviting and enabling response. That is, what is at issue is a matter of responsibility for the violence of the cut and the co-constitution of entangled relations of obligation. What is entailed in matters of justice is paying careful attention to the ghosts in all their materiality – that is, all the labor, the really hard work, of tracing entanglements and being responsive to the liveliness of the world. An agential cut is not a simple severing, it is a knife-edge that cuts together-apart, materially as well as ethically.

It seems to me that quantum physics, in its agential existence as a worldly entity/organism in its own right (not just animate and inanimate beings, but all materializing practices, like theorizing, formulating, and imagining, are lively practices of worlding), offers these remarkable gifts, and puts forward the possibility of thinking things like

separability and discontinuity in unanticipated directions. What’s so remarkable to me about quantum physics is how astonishingly queer it is – it is so queer that it queers queer, keeping it in motion, something queer activists have seen as vital to its political purchase. Not only specific binaries are destabilized, but even the cuts are iteratively cross-cut. Quantum physics in its iterative material becoming is amazing. It’s an awesome thing to watch physics – and the larger world for that matter! – iteratively deconstruct itself in these marvelously creative ways. Quantum physics is dis/continuous with classical physics. The specificities of that are really interesting. Newtonian physics, what used to be called natural philosophy, is far more queer than has been generally acknowledged. There is this ongoing way in that which physics keeps deconstructing itself that has been so much more powerful than anything that has gone by the name of cultural critique of physics. So that’s what I feel I’m trying to share. How remarkable it is that the worlding of world gives us gifts like this.

*I: Yes, and thank you for that effort. One might say, that thinking technologies, theories, are part of what makes us into specific beings – and also specific thinking beings – for example, as I started reading poststructuralist feminist thinking the world and I got put together in altered ways, – and it happens again reading non-Newtonian thinking of space and time and certainly your work. Can you relate to that idea – and how do you live and breathe your own theorizing, so to speak?*

*Karen Barad:* That’s a really wonderful question. Indeed, this is not an academic exercise for me at all; no, this is very much a part of my lived experience, which I don’t mean in a phenomenological sense but in phenomenon sense! (Laughs) Some people have asked me if I walk around in the world differently as a result of being steeped in

these ideas. And I have to say “yes” with the qualification that I am neither in the ideas nor are they in me. In particular, these ideas are not in my head, rather they are specific ongoing reconfigurings of the world in its iterative intra-activity. These ideas are not outside or inside me, they are threaded through “me” and “me” through them, or rather we are threaded through one another. I think it makes a difference to be attuned to phenomena rather than things, to be aware of being a particular configuration of the world intra-acting with and being reconfigured together with a world of other phenomena. It’s been very important to me that these ideas are threaded through my bones, my gut, my legs, and that they are alive to me at the most mundane levels of my life and the most important areas of my life. It’s important to me in terms of my teaching, it’s important to me in terms of my relationship with my friends and family. I am aware that while we are here in Corfu now, talking together, looking at the sea from this terrace that I’m not some individual who travels through the world as a fixed entity, as if I were the same here as I was before I left California at the end of the quarter. I’m

constantly being reconfigured. Or rather the ongoing reconfigurings of the world are iteratively remaking “me.” But now it seems we’re back where we started. But actually that isn’t really the case – is it? – because the universe now has our conversation enfolded into its being. Thank you for this opportunity.

## NOTES

1. The interview was prepared by Nete Schwenesen and Malou Juelskjær in conversation with Stine Adrian. The interview was conducted by Nete and Malou and edited by Karen, Nete and Malou.
2. Puig de la Bellacasa, Maria (2011): Matters of care in technoscience: Assembling neglected things, in: *Social Studies of Science*. vol. 41 no. 1.
3. Latour, Bruno (2004): Why has critique run out of steam? From matters of fact to matters of concern, in: *Critical inquiry*. 30:2
4. Caspers, Monica (1998): *The making of the unborn patient: A social anatomy of fetal surgery*. NJ: Rutgers University Press
5. Barad, Karen (2010): Quantum entanglements and hauntological relations of inheritance: Dis/continuities, spacetime enfoldings, and justice-to-come, in: *Derrida Today*. 3(2)