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Diffractioning Diffraction: Cutting Together-Apart

Karen Barad

Diffract – *dif-frangĕre* – to break apart, in different directions¹ (as in classical optics)

Diffraction/intra-action – cutting together-apart (one move) in the (re)configuring of spacetime-mattering; differencing/differing/différance

Diffraction owes as much to a thick legacy of feminist theorizing about difference as it does to physics. As such, I want to begin by re-turning – not by returning as in reflecting on or going back to a past that was, but re-turning as in turning it over and over again – iteratively intra-acting, re-diffracting, diffracting anew, in the making of new temporalities (spacetime-matterings), new diffraction patterns.² We might imagine re-turning as a multiplicity of processes, such as the kinds earthworms revel in while helping to make compost or otherwise being busy at work and at play: turning the soil over and over – ingesting and excreting it, tunnelling through it, burrowing, all means of aerating the soil, allowing oxygen in, opening it up and breathing new life into it.³ It might seem a bit odd to enlist an organic metaphor to talk about diffraction, an optical phenomenon that might seem lifeless. But diffraction is not only a lively affair, but one that troubles dichotomies, including some of the most sedimented and stabilized/stabilizing binaries, such as organic/inorganic and animate/inanimate. Indeed, the quantum understanding of diffraction troubles the very notion of *dicho-tomy* – cutting into two – as a singular act of absolute differentiation, fracturing this from that, now from then.

Re-turning as a mode of intra-acting with diffraction – diffracting diffraction – is particularly apt since the temporality of re-turning is integral to the phenomenon of diffraction.⁴ As I have explained elsewhere, intra-actions enact agential cuts, which do not produce absolute separations, but rather cut together-apart (one move).⁵ Diffraction is not a set pattern, but rather an iterative (re)configuring of patterns of differentiating-entangling. As such, there is no moving beyond, no leaving the ‘old’ behind. There is no absolute boundary between here-now and there-then. There is nothing that is new; there is nothing that is not new.⁶ Matter itself is diffracted, dispersed, threaded through with materializing and sedimented effects of iterative reconfigurings of spacetime-mattering, traces of what might yet (have) happen(ed). Matter is a sedimented intra-acting, an open field. Sedimenting does not entail closure. (Mountain ranges in their liveliness attest to this fact.)

Diffraction is not a singular event that happens in space and time; rather, it is a dynamism that is integral to spacetime-mattering. Diffractions are untimely. Time is out of joint; it is diffracted, broken apart in different directions, non-contemporaneous with itself. Each moment is an infinite multiplicity. 'Now' is not an infinitesimal slice but an infinitely rich condensed node in a changing field diffracted across spacetime in its ongoing iterative repatterning.⁷

Let's begin by re-turning (to) the past – to a key moment in feminist theorizing about diffraction. Rather than zooming in on one moment in time (as if there were such an infinitesimal temporal slice or instant of time that could be naturally picked out from a presumed whole line of sequential points) in order to see the infinity that lives through it, we re-turn to a thicker 'moment' of spacetime-mattering – which we might designate by the spacetime coordinates Santa Cruz, CA late 1980s/early 1990s – when, thanks to the enormous labours and persistence of women of colour, questions of differences broke through the breakwater of Universal Sisterhood, built on the foundations of sameness and shared commonalities, to become vital to, if not the lifeblood of, feminist theorizing. This moment is dispersed/diffracted throughout the paper, and this moment, like all moments, is itself a diffracted condensation, a threading through of an infinity of moments-places-matterings, a superposition/entanglement, never closed, never finished.

Let's re-turn (to) the spacetime coordinate: Santa Cruz 1988.

Trinh Minh-ha is presenting her paper 'Not You/Like You' for a UC Santa Cruz Cultural Studies gathering.

Many of us still hold on to the concept of difference not as a tool of creativity to question multiple forms of repression and dominance, but as a tool of segregation, to exert power on the basis of racial and sexual essences. The apartheid type of difference. [...] [But] [d]ifference as understood in many feminist and non-Western contexts [...] is not opposed to sameness, nor synonymous with separateness. [...] There are differences as well as similarities *within* the concept of difference.⁸

Trinh is troubling particular notions of identity and difference defined through a colonizing logic whereby the 'self' maintains and stabilizes itself by eliminating or dominating what it takes to be the other, the non-I. This logic entails the setting of an absolute boundary, a clear dividing line, a geometry of exclusion that positions the self on one side, and the other – the not-self – on the other side.⁹

Identity as understood in the context of a certain ideology of dominance has long been a notion that relies on the concept of an essential, authentic core that remains hidden to one's consciousness and that requires the elimination of all that is considered foreign or not true to the self, that is to say, non-I, other. In such a concept the other is almost unavoidably either opposed to the self or submitted to

the self's dominance. It is always condemned to remain its shadow while attempting at being its equal. Identity, thus understood, supposes that a clear dividing line can be made between I and not-I, he and she; between depth and surface, or vertical and horizontal identity; between us here and them over there.¹⁰

The self in positioning itself against the other, constituting the other as negativity, lack, foreignness, sets up an impenetrable barrier between self and other in an attempt to establish and maintain its hegemony. The self ('I') only ever sees itself, and not the other. The other, the 'non-I', is consigned to the shadow region, the space behind the mirror. According to this geometrical optics, the other is constituted as the Other. Difference as apartheid. As Trinh explains, this notion of difference premised on binary thinking has been instrumental to the workings of power, but it is not a necessary way of figuring difference.

Divide and conquer has for centuries been his creed, his formula of success. But a different terrain of consciousness has been explored for some time now, a terrain in which clear cut divisions and dualistic oppositions such as science vs. subjectivity, masculine vs. feminine, may serve as departure points for analytical purpose but are no longer satisfactory if not entirely untenable to the critical mind.¹¹

What is needed, Trinh emphasizes, is a disruption of the binary, a way to figure difference differently. If this is to be the case then difference cannot be positioned in opposition to sameness, not in any absolute sense, for this would reiterate the same problematic logics. As Trinh puts it: a non-binary conception of difference is 'not opposed to sameness, nor synonymous with separateness'.¹²

How might difference be figured in a way that disrupts this geometrical optics of closure, this colonizing logic? How might difference be figured differently?¹³

Bologna, mid-seventeenth century. Francesco Grimaldi is at work opening up a new field of optics, unwittingly so perhaps, but his experiments take him into a realm where light pushes through and around boundaries. Grimaldi is performing a series of experiments whereby sunlight is constrained to enter a dark room through a pinhole, and whereby the narrow stream of light is made to encounter a thin rod in its course, casting its shadow on a screen. Grimaldi observes that the boundary of the shadow is not sharply defined and that a series of colored bands lie near the shadow of the rod. He is certain that these observations cannot be explained by known laws of ray propagation: reflection and refraction. For starters, the shadow is larger than the projected geometrical area; geometrical optics doesn't cut it.

Replacing the thin rod with a rectangular blade he observes diffraction fringes – bands of light *inside* the edge of the shadow. Bands of light appear inside the shadow region – the region of would-be total darkness; and bands of darkness appear outside the shadow region. There is no sharp boundary separating the light from the darkness: light appears within the darkness within the light within... Grimaldi is

clear that the explanation for these remarkable findings could not lie with the corpuscular theory of light. Imagining light to behave as a fluid which upon encountering an obstacle breaks up and moves outwards in different directions, Grimaldi dubbed this phenomenon *diffraction*, citing the Latin verb *diffringere* – *dis* (*apart*) and *frangere* (*break*).¹⁴

Santa Cruz (the un/holy cross roads), sometime before 1987. Gloria Anzaldúa is busy at work writing *Borderlands*, a foundational text in feminist studies. She is explaining the Coatlicue state, the prelude to crossing over.

Every time she makes ‘sense’ of something, she has to ‘cross over’, kicking a hole out of the old boundaries of the self [...] It is her reluctance to cross over, to make a hole in the fence and walk across, to cross the river, to take that flying leap into the dark, that drives her to escape, that forces her into the fecund cave of her imagination where she is cradled in the arms of Coatlicue [...].¹⁵

Grimaldi easily punctures a second pinhole into the barrier ...

Anzaldúa pokes a hole in the colonizer’s story of how darkness is the other of light, how it sits on the not-light side of the darkness/light binary, about how this story figures darkness as absence, lack, negativity.

There is darkness and there is darkness. Though darkness was ‘present’ before the world and all things were created, it is equated with matter, the maternal, the germinal, the potential. The dualism of light/darkness did not arise as a symbolic formula for morality until primordial darkness had been split into light and dark. Now Darkness, my night, is identified with the negative, base and evil forces – the masculine order casting its dual shadow – and all these are identified with dark skinned people.¹⁶

Grimaldi studies what happens when sunlight passes through two adjacent pinholes (perhaps the first laboratory-produced two-slit diffraction experiment). He notes a most remarkable feature:

That a body actually enlightened may become obscure by *adding* new light to that which it has already received.¹⁷

The two-slit diffraction experiment queers the binary light/darkness story. What the pattern reveals is that darkness is not a lack. Darkness can be produced by ‘adding new light’ to existing light – ‘to that which it has already received’. Darkness is not mere absence, but rather an abundance. Indeed, darkness is not light’s expelled other, for it haunts its own interior. Diffraction queers binaries and calls out for a rethinking of the notions of identity and difference.

England early 1800s. Thomas Young is able to provide a mathematical understanding of the diffraction pattern:

When two undulations, from different origins, coincide either perfectly or very nearly in Direction, their joint effect is a combination of the Motions belonging to each.¹⁸

He goes on to explain that the combined effect depends on the difference in path length – that is, how far the light from each slit has to travel to get to a particular point on the screen and whether or not the waves arrive in phase (crest to crest) or out of phase (crest to trough) or somewhere in between. In this way, one might say that Young gives us an understanding of diffraction as the effect of differences.

Santa Cruz 1992. Donna Haraway, feminist theorist, master of the art of figuration, reads Trinh's account of difference through the figure of diffraction.

Trinh Minh-ha's metaphors suggest another geometry and optics for considering the relations of difference [...] perhaps a differential, diffracted feminist allegory might have the 'inappropriate/d others' emerge from a third birth into an SF world called elsewhere – a place composed from interference patterns. Diffraction does not produce 'the same' displaced, as reflection and refraction do. Diffraction is a mapping of interference, not of replication, reflection, or reproduction. A diffraction pattern does not map where differences appear, but rather maps where the *effects* of difference appear.¹⁹

As Haraway explains, Trinh's notion of an 'inappropriate/d other' disrupts understandings of difference that are based on taxonomies that locate subjects according to natural kinds.

To be an 'inappropriate/d other' means to be in critical, deconstructive relationality, in a diffracting rather than reflecting (ratio)nality – as the means of making potent connection that exceeds domination. To be inappropriate/d is not to fit in the taxon, to be dislocated from the available maps specifying kinds of actors and kinds of narratives, not to be originally fixed by difference.²⁰

Crossroads/Diffraction: Santa Cruz and Claremont, CA 1991. I am sitting outdoors with Gloria Anzaldúa talking about quantum physics and mestiza consciousness. It's the late winter and Anzaldúa has come to Pomona College as an invited lecturer to talk with our faculty seminar group. I am teaching in the Physics Department, sitting in on Deena Gonzalez's *Latina Feminist Traditions* class, and co-organizing a multi-disciplinary faculty seminar on the nature of theory – we're studying *Borderlands*. At the time Anzaldúa was living in Santa Cruz. I am already at the crossroads, but not yet in Santa Cruz.²¹

Gloria and I talk about quantum physics, the two-slit diffraction experiment, waves and particles and *mita' y mita'*.²² We are happily making diffraction patterns.

They called her half and half, *mita' y mita'*, neither one nor the other [neither male nor female] but a strange doubling, a deviation of nature that horrified, a work of nature inverted.²³

Electrons are queer particles, *mita' y mita'*. They are particles. They are waves. Neither one nor the other. A strange doubling. A queer experimental finding. A theoretical impossibility (at least from the point of view of classical Newtonian physics). Unable to account for its inappropriate behaviour, physicists label it 'wave-particle duality', a disturbing paradox.

There is something compelling about being both male and female, about having an entry into both worlds. Contrary to some psychiatric tenets, half and halves are not suffering from confusion of sexual identity, or even from a confusion of gender. What we are suffering from is an absolute despot duality that says we are able to be only one or the other.²⁴

According to classical Newtonian physics, the two-slit diffraction apparatus is the ultimate ontological sorting machine – it unambiguously differentiates particles from waves: waves make diffraction patterns because they can go through both slits at once, particles don't. But in the early twentieth century electrons passing through a diffraction apparatus fail to behave like proper particles. Rather they behave like waves. Indeed, it seems that *each individual* electron is somehow going through *both* slits *at once*. (Talk about inappropriate!) To make matters worse, each individual electron arrives at one point on the screen just like a proper particle. Now add a which-slit detector to the apparatus (to watch an electron going through the slits) and the electrons behave like particles. Impossible they say, but this is the electron's lived experience.

But I, like other queer people, am two in one body, both male and female.²⁵

Niels Bohr (Copenhagen circa 1927) is finally able to give an explanation that accommodates the queer behaviour of electrons. He says that what is needed is a radical reworking of the classical worldview, including a new quantum epistemology that does not take the Cartesian subject-object dualism for granted.

The work of mestiza consciousness is to break down the subject-object duality that keeps her a prisoner and to show in the flesh and through the images of her work how duality is transcended.²⁶

Bohr explains how it is possible for electrons to *perform* particle-ness under certain experimental circumstances and wave-ness under others. The key is understanding that identity is not essence, fixity or givenness, but a contingent iterative

performativity, thereby reworking this alleged conflict into an understanding of difference not as an absolute boundary between object and subject, here and there, now and then, this and that, but rather as the effects of enacted cuts *in a radical reworking of cause|effect*.²⁷

[B]ones often do not exist prior to the flesh [...] I believe in an ordered, structured universe where all phenomena are interrelated and imbued with spirit. [...]

I like to think of them as performances and not as inert and 'dead' objects [...] the object/event [...] is 'enacted', it is both a physical thing and the power that infuses it.²⁸

The two-slit diffraction experiment is at the centre, the very heart, of quantum physics. As Nobel laureate physicist Richard Feynman put it, the two-slit diffraction experiment is

a phenomenon which is impossible, absolutely impossible, to explain in any classical way [...] it] has in it the heart of quantum mechanics. In reality, it contains the only mystery.²⁹

Mystery is alive and well in physics, making its current home in quantum mechanics. There is a tradition of this, despite all attempts to defend physics against "irrationalisms". Spirits were a part of Newton's natural philosophy, if not his natural theology. The chap who would 'feign no hypothesis' was accused of introducing mysticism into physics when he decided to banish the spirits from his natural philosophy, opting instead for spooky action-at-a-distance. Physics has always been spooked.³⁰

They called her half and half, *mita' y mita'* [...] a deviation of nature that horrified, a work of nature inverted. But there is a magic aspect in abnormality and so-called deformity. Maimed, made, and sexually different people were believed to possess supernatural powers by primal cultures' magico-religious thinking. For them, abnormality was the price a person had to pay for her or his inborn extraordinary gifts.³¹

Gender Trouble. Diffraction troubles the onto(epistemo)logy of classical physics. According to classical Newtonian physics, everything is one or the other: particle or wave, this or that, here or there. Quantum physics queers the binary type of difference at every layer of the onion (not merely on the micro-scale as opposed to the macro-scale, as if there were a line in the sand between micro and macro rather than an ongoing reconfiguring of spacetimemattering across and within spaces and times).

But I, like other queer people, am two in one body, both male and female. I am the embodiment of the *hieros gamos*: the coming together of opposite qualities within.³²

How can we understand this coming together of opposite qualities within, not as a flattening out or erasure of difference, but as a relation of *difference within*? Anzaldúa addresses this by proposing an antidote to *homophobia* – *fear of going home*,³³ the inability to go home – namely, *mestiza consciousness*, having a queer political identity – ‘one that slips in and out of the white, the Catholic, the Mexican, indigenous, the instincts [...]. It is a path of knowledge – one of knowing (and of learning) the history of oppression of our *raza*. It is a way of balancing, of mitigating duality’.³⁴ Living between worlds, crossing (out) taxonomic differences, tunnelling through boundaries (which is not a bloodless but a necessary revolutionary political action), Anzaldúa understood the material multiplicity of self, the way it is diffracted across spaces, times, realities, imaginaries.

In queering the classical physics understanding of a fixed and given nature, an ontology of different taxonomic kinds – wave or particle – Bohr suggested a (proto)performative approach to the so-called ‘wave-particle duality problem’ – rethinking mattering – what it means to matter, what matter means – in a rethinking of the nature of difference. Bohr understood difference in its materiality. Meaning is not an ideality; meaning is material. And matter isn’t what exists separately from meaning. Mattering is a matter of what comes to matter and what doesn’t. Difference isn’t given. It isn’t fixed. Subject and object, wave and particle, position and momentum do not exist outside of specific intra-actions that enact cuts that make separations – not absolute separations, but only contingent separations – *within* phenomena.

[T]he pair is no longer outside/inside, that is to say, objective vs. subjective, but something between inside/inside – objective in what is already claimed as objective. So, no real conflict.³⁵

Difference is understood as differencing: differences-in-the-(re)making. Differences are *within*; differences are formed through intra-activity, in the making of ‘this’ and ‘that’ within the phenomenon that is constituted in their inseparability (entanglement). Indeed, this is a point just as much about electrons with one another as it is about onto-epistemological intra-actions involving humans. Subjectivity and objectivity are not opposed to one another; objectivity is not not-subjectivity.

The moment the insider steps out from the inside she’s no longer a mere insider. She necessarily looks in from the outside while also looking out from the inside. Not quite the same, not quite the other, she stands in that undetermined threshold place where she constantly drifts in and out. [...] She is, in other words, this inappropriate other or same who moves about with always at least two gestures: that of affirming ‘I am like you’ while persisting in her difference and that of reminding ‘I am different’ while unsettling every definition of otherness arrived at.³⁶

This double movement, this play of in/determinacy, unsettles the self/other binary and the notion of the self as unity. The self is itself a multiplicity, a superposition of beings, becomings, here and there's, now and then's. Superpositions, not oppositions.

Thus, Two does not necessarily imply separateness for it is never really equated with duality, and One does not necessarily exclude multiplicity for it never expresses itself in one single form, or in uniformity.³⁷

Entanglements are not unities. They do not erase differences; on the contrary, entanglings entail differentiating, differentiating entail entanglings. One move – *cutting together-apart*.

This is not to say that the historical I can be obscured and ignored and that differentiation cannot be made, but that I is not unitary, culture has never been monolithic and is always more or less in relation to a judging subject. Differences do not only exist between outsider and insider – two entities. They are also at work within the outsider herself or the insider, herself – a single entity.³⁸

Difference is not some universal concept for all places and times, but is itself a multiplicity within/of itself. Difference itself is diffracted. Diffraction is a matter of differences at every scale, or rather in the making and remaking of scale (spacetime-matterings). Each bit of matter, each moment of time, each position in space is a multiplicity, a superposition/entanglement of (seemingly) disparate parts. Not a blending of separate parts or a blurring of boundaries, but in the thick web of its specificities, what is at issue is its unique material historicities and how they come to matter. Elsewhere, within here.³⁹ Superpositions.

[N]ot only that we live in many worlds at the same time, but also that these worlds are, in fact, all in the same place – the place each one of us is here and now.⁴⁰

Quantum physics radically queers the classical physics understanding of diffraction. *Differences within* (dark within light within dark ...) move to a deeper level of meaning-mattering (differentiating-entangling). ('Move to' means without ever leaving classical understandings behind; rather they are always already threaded through.) From 'breaking apart' to 'cutting together-apart,' from 'light within dark within light' to 'agential separability'.⁴¹

Superpositions – here and there, now and then – are not a simple multiplicity, not a simple overlaying or a mere contradiction. Superpositions aren't inherent; they are the effects of agential cuts, material enactments of differentiating/entangling.

Quantum superpositions radically undo classical notions of identity. Quantum superpositions tell us that being/becoming is an

indeterminate matter. [For example, when it comes to Schrödinger's cat] it is not simply that the cat is both dead and alive, nor neither dead nor alive, nor part alive and part dead, nor somewhere between dead and alive; [rather, there] *is not a determinate fact of the matter* concerning the cat's state of being alive or dead. It is a ghostly matter!⁴²

To live in the Borderlands means you
are neither *hispana india negra española*
ni gabacha, eres mestizo, mulata, half-breed
caught in the crossfire between camps
while carrying all five races on your back
not knowing which side to run to, run from;

Cuando vives en la frontera
people walk through you, the wind steals your voice
you're a *burra, buey*, scapegoat,
forerunner of a new race,
half and half – both woman and man, neither –
a new gender;⁴³

The existence of indeterminacies does not mean that there are no facts, no histories, no bleeding – on the contrary, indeterminacies are constitutive of the very materiality of being, and some of us live our with pain, pleasure, and also political courage...

To live in the Borderlands means to
put *chile* in the borscht,
eat whole wheat *tortillas*,
speak Tex-Mex with a Brooklyn accent;
be stopped by *la migra* at the border checkpoints;

In the Borderlands
you are the battleground
where enemies are kin to each other;
you are at home, a stranger,
the border disputes have been settled
the volley of shots have shattered the truce
you are wounded, lost in action
dead, fighting back;⁴⁴

Quantum multiplicity, quantum in/determinacy, is not a simple dispersion without a holding together of the disparate within. *Agential separability* – the agentially enacted material conditions of *exteriority-within-phenomena* – is what agential cuts enact in their cutting together-apart.

To think the ‘holding together’ of the *disparate* itself. Not to maintain together the disparate, but to put ourselves there where the disparate itself holds together, without wounding the dis-jointure, the dispersion, or the difference, without effacing the heterogeneity of the other.⁴⁵

Quantum entanglements are not the intertwining of two (or more) states/entities/events, but a calling into question of the very nature of two-ness, and ultimately of one-ness as well. Duality, unity, multiplicity, being are undone. ‘Between’ will never be the same. One is too few, two is too many. [...] Quantum entanglements require/inspire a different sense of a-count-ability, a different arithmetic, a different calculus of response-ability.⁴⁶

To survive in the Borderlands
you must live *sin fronteras*
be a crossroads.⁴⁷

Mestiza consciousness. Marrano consciousness.⁴⁸ Trans/queer/intersex consciousness. Transmaterialities.⁴⁹

The here-there, and the elsewhere within here, all at once.⁵⁰

Diffraction – differing/differing

Does [justice] come simply to repair injustice or more precisely to rearticulate *as must be* the disjointure of the present time? [...] Does not justice as relation to the other suppose [...] the irreducible excess of a disjointure or an anachrony, [...] some ‘out of joint’ dislocation in Being and in time itself [...]:⁵¹

Indeterminacy is not a state of being but a dynamic through which that which has been constitutively excluded re-turns. The *arrivant*.⁵² That which is determinate (e.g. intelligible) is materially haunted by – infused with – that which is constitutively excluded (remains indeterminate, e.g., unintelligible). To witness the dispersion of the wavepacket is to see the force of indeterminacy in action. The self doesn’t hold; the self is dispersed in an un/doing of self as a result of being threaded through by that which is excluded. There is no absolute outside; the outside is always already inside. In/determinacy is an always already opening up-to-come. In/determinacy is the surprise, the interruption, by the stranger (within) re-turning unannounced.

[A] ghost never dies, it remains always to come and to come back.⁵³

Agential cuts never sit still [...]. Inside/outside is undone. [...] An uncanny topology: no smooth surfaces, willies everywhere. Differences percolate through every ‘thing’, reworking and being

reworked through reiterative reconfigurings of spacetime matters
[...] each being (re)threaded through the other. Differences are
always shifting within. Intra-actions don't occur between presences.
Intra-actions are a ghostly causality, of a very different order.⁵⁴

Boundaries don't hold; times, places, beings bleed through one another.

This is my home
this thin edge of
barbwire.

But the skin of the earth is seamless.
The sea cannot be fenced,
el mar does not stop at borders.
To show the white man what she thought of his
arrogance,
Yemaya blew that wire fence down.

This land was Mexican once,
was Indian always
and is.
And will be again.

*Yo soy un puente tendido
del mundo gabacho al del mojado,
Lo pasado me estirá pa' 'trás
y lo presente pa' 'delante.
Que la Virgen de Guadalupe me cuide
Ay ay ay, soy Mexicana de este lado.*

The U.S.-Mexican border *es una herida abierta* where the Third World
grates against the first and bleeds. And before a scab forms it
haemorrhages again, the lifeblood of two worlds merging to form a
third country – a border culture. Borders are set up to define the
places that are safe and unsafe, to distinguish *us* from *them*. A border is
a dividing line, a narrow strip along a steep edge. A borderland is a
vague and undetermined place created by the emotional residue of an
unnatural boundary. It is in a constant state of transition. The
prohibited and forbidden are its inhabitants.⁵⁵

Does not justice as relation to the other suppose... the irreducible
excess of a disjointure or an anachrony, [...] some “out of joint”
dislocation in Being and in time itself [...] ?⁵⁶

Quantum dis/continuity is the un/doing. (Even un/doing itself, as well as
the notion of itself.) Even its appellation is at once redundant and
contradictory: a smallest unit, *a discontinuous bit... of discontinuity*.

‘Quantum’, ‘discontinuity’ – each designation marking a disruption, bringing us up short, disrupting us, disrupting itself, stopping short before getting to the next one. A rupture of the discontinuous? A disrupted disruption? A stutter? A repetition not of what comes before, or after, but a disruption of before/after. A cut that is itself cross-cut. A cut raised to a higher power forever repeating. A passable impassability. (An irresolvable internal contradiction, a logical disjunction, an im-passe (from the Latin *a-poria*), but one that can’t contain that which it would hold back. Porosity is not necessary for quantum tunnelling – a specifically quantum event, a means of getting through, without getting over, without burrowing through. Tunnelling makes mincemeat of closure, no w/holes are needed.) [...] A possible impossibility, an impossible possibility. An ontological im/probability. Identity undone by a discontinuity at the heart of matter itself. What spooky matter is this, this *quantum discontinuity*?⁵⁷

Empirical evidence for a *hauntology*.⁵⁸

1982–2000 Elsewhere / 2010 Santa Cruz.⁵⁹ Experimental meta/physics.

Send atoms through a two-slit diffraction grating. The well-known result is a diffraction pattern: the atoms behave like waves. But atoms elsewhere show themselves as particles. And proper particles don’t go through multiple slits at once! Einstein suggested we add a which-slit detector to track which slit each atom goes through on its way to the screen. But as Bohr warned if we add a which-slit detector the pattern will no longer be a diffraction pattern, but rather, a scatter pattern, indicative of particles. In other words, the atoms now behave like particles and go through one slit or the other; unlike waves, which go through both slits at once (which is what makes for a diffraction pattern).

Because I, a *mestiza*,
continually walk out of one culture
and into another,
because I am in all cultures at the same time⁶⁰

This is direct evidence of Bohrian complementarity: wave and particle are not inherent attributes of objects, but rather the atoms perform wave or particle in their intra-action with the apparatus. The apparatus is an inseparable part of the observed phenomenon.

Now add to this experimental apparatus an ‘eraser’ – a mechanism that when activated removes any would-be which-slit information. Now we’re ready to see what happens if we do a which-slit experiment with the ability to erase the which-slit information after it is obtained. Here goes: *after* the particle goes through one slit or another (as a proper particle will) use the eraser to erase the which-slit information. Does the diffraction pattern return? Remarkably, it does! But contrary to some reports on the experiment, the diffraction pattern does not simply return, it **re-turns**! In particular, the diffraction pattern shows up only for those who will do the hard

work of tracing the quantum entanglements. Only by tracing the quantum entanglements is it possible to find a diffraction pattern embedded in the overall pattern! Lest the profundity of this finding escape notice, the finding of this experiment indicates that it is possible to determine *after* the particle has already gone through the slits whether or not it will have gone through one slit or the other (as a proper particle will do) or both slits simultaneously (as waves will do)! That is, it is possible to not merely change what it will have done after the fact but to *change who/what it will have been, that is, its very ontology* (wave or particle)!

Empirical evidence that it is possible to change the past?

Not so fast.

It's not that (in erasing the information after the fact that) the experimenter changes a past that had already been present. Rather, the point is that the past was never simply there to begin with and the future is not simply what will unfold; the 'past' and the 'future' are iteratively reworked and enfolded through the iterative practices of spacetime-mattering – including the which-slit measurement and the subsequent erasure of which-slit information – all are one phenomenon. [...] Space and time are phenomenal, that is, they are intra-actively produced in the making of phenomena; neither space nor time exist as determinate givens, as universals, outside of phenomena.⁶¹

The concern is 'not with horizons of modified – past or future – presents, but with a "past" that has never been present, and which never will be, whose future to come will never be a production or a reproduction in the form of presence'.⁶²

Empirical evidence that the past is always open (as is the future) – indeterminacy all the way down. Empirical evidence for a hauntology.

The quantum eraser experiment re-turns us to questions of diffraction a-new. Not only does this experiment re-turn us to thinking anew about diffraction, it was always already a part of thinking diffraction/difference/différance.

I want to slow things down and stay with the quantum eraser diffraction experiment since it brings to the fore questions of temporality, materiality and justice that are crucial to and have always already been a part of discussions of diffraction/differencing. But since this paper is in effect performing a diffraction experiment of diffraction, it's important that any 'I' that might have seemed to give a sense of narration be interrupted, since this positioning is counter to diffracting. There is no 'I' that exists outside of the diffraction pattern, observing it, telling its story. In an important sense, this story in its ongoing (re)patterning is (re)(con)figuring me. 'I' am neither outside nor inside; 'I' am *of* the diffraction pattern. Or rather, this 'I' that is not 'me' alone and never was, that is always already multiply dispersed and

diffracted throughout spacetime(mattering), including in this paper, in its ongoing being-becoming *is of* the diffraction pattern.⁶³

Despite its name – quantum eraser – nothing is erased (although some kinds of erasure are surely at issue). [Barad]^{64,65}

Myth re-members a history that has been forgotten and erased. [Anzaldúa]⁶⁶

Even the re-turn of a diffraction pattern does not signal a going back, an erasure of memory, a restoration of a present past. *Memory – the pattern of sedimented enfoldings of iterative intra-activity – is written into the fabric of the world.* The world ‘holds’ the memory of all traces; or rather, the world *is* its memory (enfolded materialisation). [Barad]⁶⁷

When history separated itself from story, it started indulging in accumulation of facts. Or it thought it could. It thought it could build up to History because the Past, unrelated to the Present and the Future, is lying there in its entirety, waiting to be revealed and related. [Trinh]⁶⁸

The past is not present. ‘Past’ and ‘future’ are iteratively reconfigured and enfolded through the world’s ongoing intra-activity. [...] Phenomena are not located in space and time; rather, *phenomena are material entanglements enfolded and threaded through the spacetime-mattering of the universe.* [Barad]⁶⁹

Every gesture, every word involves our past, present, and future. [...] My story, no doubt, is me, but it is also, no doubt, older than me. Younger than me, older than the humanized. [...] Each story is at once a fragment and a whole; a whole within a whole. And the same story has always been changing, for things which do not shift and grow cannot continue to circulate. [Trinh]⁷⁰

Time can’t be fixed. [Barad]⁷¹

[O]ral storytelling and constant retellings encourage horizontal productions and proliferations of new, recycled, and modified narrative meanings rather than one unifying unchanging history that dictates who belongs and who doesn’t (Us versus Them). [...] Where traditional nationalism closes off connections and writes a singular history of the nation, Trinh’s [...] push to create endless connections opens up the possibility of unending meanings. [Marsan]⁷²

The ability to respond is what is meant by responsibility... [Anzaldúa]⁷³

To address the past (and future), to speak with ghosts, is not to entertain or reconstruct some narrative of the way it was, but to respond, to be responsible, to take responsibility for that which we inherit (from the past and the future), for the entangled relationalities of inheritance that ‘we’ *are*, to acknowledge and be responsive to the noncontemporaneity of the present, to put oneself at risk, to risk oneself (which is never one or self), to open oneself up to indeterminacy in moving towards what is to-come. [Barad]⁷⁴

No justice [...] seems possible or thinkable without the principle of some *responsibility*, beyond all living present, within that which disjoins the living present, before the ghosts of those who are not yet born or who are already dead, [...]. Without this *non-contemporaneity with itself of the living present*, [...] without this responsibility and this respect for justice concerning those who *are not there*, of those who are no longer or who are not yet *present and living*, what sense would there be to ask the question ‘where?’ ‘where tomorrow?’ ‘whither?’. [Derrida]⁷⁵

Time can’t be fixed. The past is never closed, never finished once and for all, but there is no taking it back, setting time aright, putting the world back on its axis. There is no erasure finally. The trace of all reconfigurings is written into the enfolded materialisations of what was/ is/ to-come. [Barad]⁷⁶

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 realization of some existing possibility, but through the iterative reworking of im/possibility, an ongoing rupturing, a cross-cutting of topological reconfiguring of the space of response-ability. [Barad]⁷⁷

Life is a perpetual to and fro, a dis/continuous releasing and absorbing of the self. Let her weave her story within their stories, her life amidst their lives. And while she weaves, let her whip, spur, and set them on fire. Thus making them sing again. Very softly a-new again. [Trinh]⁷⁸

What if we were to recognize that differentiating is a material act that is not about radical separation, but on the contrary, about making connections and commitments? [Barad]⁷⁹

The thread created moves forward crisscrossed and interlaced by other threads until it breaks with its own linearity; and hence, a story is told mainly to say that there is no story – only a complex, tightly knit tissue of activities and events that have no single explanation, as in life. [Trinh]⁸⁰

This paper starts out in the middle by going forward to the past – not in order to recount what once was, but by way of re-turning, turning it over and over again, tasting the rich soil from which ideas spring, and opening up again to the uncountable gifts given that still give, to proceed to the place from which we never left/leave. [Barad]⁸¹

Time leaves traces in a multitude of layers and scales in the realm of life. Everything is time. Stone, tree, mountain, ocean; thoughts, doubts, clouds – we are time. [Trinh]⁸²

Walking by the ocean in Santa Cruz, I re-turn again and again to thoughts of diffraction and entanglement. The conversation is ongoing. The redwoods, the ocean, the paths taken and those which may yet have been taken hold the memory of these explorations by foot and by mind. We are being churned by the soil, the wind, the foggy mist. A multiplicity, an infinity in its specificity, condensed into here-now. Each grain of sand, each bit of soil is diffracted/entangled across spacetime. Responding – being responsible/response-able – to the thick tangles of spacetimematterings that are threaded through us, the places and times from which we came but never arrived and never leave is perhaps what re-turning is about. [Barad]⁸³

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Notes

¹ Etymology: < Latin *diffract-*, participial stem of *diffring-ēre* to break in pieces, shatter, < *dif-*, dis- prefix 1a + *frangēre* to break (OED). The following are the chief senses of *dis-* in Latin and English: 1. As an etymological element. In the

senses: a. ‘In twain, in different directions, apart, asunder,’ hence ‘abroad, away’ (...) (OED)

² While returning might have the association of reflection (how light returns from where it came once it hits the mirror), re-turning, as I hope to

develop this notion, is about diffracting. The play here between reflection/returning and diffraction/re-turning, separated only by the mere mark of a hyphen, is an important reminder that reflection and diffraction are not opposites, not mutually exclusive, but rather different optical intra-actions highlighting different patterns, optics, geometries that often overlap in practice. Perhaps this will serve as a reminder that the table in chapter 2 in *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Durham, NC: Duke University Press, 2007) is not dichotomous; rather, one might usefully think of the line of separation in the table as a cut that differentiates-entangles – reading it diffractively. I also want to emphasize that diffraction is not somehow contained in chapter 2, but rather diffraction is diffracted throughout the book, the various chapters serving as a diffraction grating for diffraction.

³ See Maria Puig de la Bellacasa, ‘Ethical Doings in NatureCultures’, *Ethics, Place & Environment*, 13:2 (2010), pp.151–169.

⁴ This will perhaps be more evident when we consider the quantum eraser diffraction experiment, but even before we get “there” “later on”, which is already in “here” “now”, it is possible to have some sense of this.

⁵ Karen Barad, *Meeting the Universe Halfway*; Karen Barad, ‘Quantum Entanglements and Hauntological Relations of Inheritance: Discontinuities, SpaceTime Enfoldings, and Justice-to-Come’, *Derrida Today*, 3:2 (2010), pp.240–268.

⁶ Karen Barad, ‘Nothing Is New/There Is Nothing That Is Not New’, invited keynote for the ‘What’s New about New Materialisms?’ Conference, University of California, Berkeley, May 5, 2012.

⁷ Just because the entanglements are infinite doesn’t mean the specificity of entanglements doesn’t matter; on the contrary, the details matter.

⁸ Trinh T. Minh-ha, ‘Not You/Like You: Post-Colonial Women and the Interlocking Question of Identity and Difference’, *Inscriptions*, special issues ‘Feminism and the Critique of Colonial Discourse’, 3–4 (1988), <http://culturalstudies.ucsc.edu/PUBS/Inscriptions/vol_3-4/minh-ha.html> [26/02/2014] [my emphasis].

⁹ I am painfully aware of the fact that it will not be possible to do justice to any of the theories mentioned here, let alone the multitudes not mentioned here to whom the notion of diffraction is indebted. I am not aiming to give over what has been said and taught by these theorists; rather, I am trying to help us to re-member by way of constructing thicker understandings of diffraction as an inherited legacy-to-come.

¹⁰ Trinh T. Minh-ha, ‘Not You/Like You’.

¹¹ Trinh T. Minh-ha, ‘Not You/Like You’.

¹² Trinh T. Minh-ha, ‘Not You/Like You’.

¹³ We will soon re-turn to Trinh again to see what she proposes. Subjects, like moments, are multiple and dispersed across/throughout this diffraction pattern.

¹⁴ ‘It has illuminated for us another, fourth way, which we now make known and call “diffraction” [i.e., shattering], because we sometimes observe light break up; that is, that parts of the compound [i.e., the beam of light], separated by division, advance farther through the medium but in different [directions], as we will soon show’. Francesco Maria Grimaldi, *Physico mathesis de lumine, coloribus, et iride, aliisque annexis libri duo* (Bologna: Vittorio Bonati, 1665), translation from note 2 on <<http://en.wikipedia.org/wiki/Diffraction>> [26/02/2014].

¹⁵ Gloria Anzaldúa, *Borderlands/La Frontera: The New Mestiza* (San Francisco: Spinsters/Aunt Lute, 1987), p.49.

¹⁶ Gloria Anzaldúa, *Borderlands*, p.49.

¹⁷ Francesco Maria Grimaldi, *Physico mathesis de lumine, coloribus, et iride, aliisque annexis libri duo* (Bologna: Vittorio Bonati, 1665), translated in *The Penny Cyclopædia*, ed. George Long (London: 1854), vol. 1, p.668; <<http://www-history.mcs.st-andrews.ac.uk/Biographies/Grimaldi.html>> [26/02/2014] [my emphasis].

¹⁸ Thomas Young, ‘On the Theory of Light and Colors’ (proposition VIII), *Journal of Natural Philosophy, Chemistry and the Arts*, vol. 2 (1802), pp.162–176.

¹⁹ Donna Haraway, ‘The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others’, in *Cultural Studies*, eds Lawrence Grossberg, Cary Nelson, Paula A. Treichler (New York: Routledge, 1992), p.300.

²⁰ Haraway, ‘Promises of Monsters’, p.300.

²¹ To briefly situate my work in physics, feminist theory and feminist science studies, at this “moment in time” that I’m inviting us to remember, when I had not yet moved to Santa Cruz but was already entangled with conversations at the crossroads, I note one reference point. By the late winter (early spring) of 1991, I had finished writing ‘Meeting the Universe Halfway: Realism and Social Constructivism without Contradiction’ (in *Feminism, Science, and the Philosophy of Science*, eds Lynn Hankinson Nelson and Jack Nelson (Kluwer, 1996), pp.161–194) – and had already received a couple of journal rejections, which makes for an interesting tale in light of the science wars of the late 1990s. In any case, it did not find a home for another five years, six total.

²² This was one of the most sacred conversations I have had in academia. I treasure this memory, not because Gloria Anzaldúa has moved on to other worlds, but because of the extraordinary quality of our conversation, the joy of it, the recognition of common passions in different languages and the gift of her generosity, kindness and focused presence. I use her first name here because my sense is that using her surname would be too formal, stiff and artificial, and I didn't want to show disrespect in this way.

²³ Gloria Anzaldúa, *Borderlands*, p.19.

²⁴ Gloria Anzaldúa, *Borderlands*, p.19.

²⁵ Gloria Anzaldúa, *Borderlands*, p.19.

²⁶ Gloria Anzaldúa, *Borderlands*, p.80.

²⁷ My proposal is that what I call 'intra-action' constitutes such a radical reworking of causality (see *Meeting the Universe Halfway*). My account of Bohr's philosophy-physics in this paper, as elsewhere, is not faithful to Bohr (as if it could be), but rather is always already diffracted through my agential realist understanding of Bohr's insights.

²⁸ Gloria Anzaldúa, *Borderlands*, p.66–67.

²⁹ See Richard Feynman, Robert B. Leighton and Matthew Sands, *Lectures on Physics* (Addison-Wesley, 1964), vol. I.

³⁰ See Karen Barad, *Ghostly Times: Entanglements, Intra-activity, and Différance*, book manuscript, forthcoming.

³¹ Gloria Anzaldúa, *Borderlands*, p.19.

³² Gloria Anzaldúa, *Borderlands*, p.19 [my emphasis].

³³ See Gloria Anzaldúa, *Borderlands*, p.20.

³⁴ Gloria Anzaldúa, *Borderlands*, p.19.

³⁵ Trinh T. Minh-ha, 'Not You/Like You'.

³⁶ Trinh T. Minh-ha, 'Not You/Like You'.

³⁷ Trinh T. Minh-ha, *Elsewhere, Within Here: Immigration, Refugeeism, and the Boundary Event* (New York: Routledge, 2011), p.56.

³⁸ Trinh T. Minh-ha, 'Not You/Like You'.

³⁹ The title of Trinh's 2011 book.

⁴⁰ Trinh T. Minh-ha, *Elsewhere, Within Here*, p.56.

⁴¹ A key concept of agential realism. See chapter 7 of *Meeting the Universe Halfway* for some of its political implications (even though it may look to some like a chapter on physics as a pure discipline, rather than a hybridity that is and has been always already political).

⁴² See Karen Barad, 'Quantum Entanglements', p.251.

⁴³ Gloria Anzaldúa, *Borderlands*, p.194.

⁴⁴ Gloria Anzaldúa, *Borderlands*, p.194.

⁴⁵ Jacques Derrida, *Specters of Marx: The State of the Debt, the Work of Mourning, & the New International*, trans. Peggy Kamuf (New York: Routledge, 1994), p.29.

⁴⁶ Karen Barad, 'Quantum Entanglements', p.251.

⁴⁷ Gloria Anzaldúa, *Borderlands*, p.195.

⁴⁸ Although some scholars have equated deconstruction with academic word play having nothing to do with the real material conditions of people's (and others'!) lives, it is worth remembering Derrida's background and political focus on questions of the other, difference, justice and alterity, including the politics of immigration and citizenship.

⁴⁹ See Karen Barad, 'Transmaterialities: Trans/Matter/Realities and Queer Political Imaginings', *GLQ*, Special Issue 'Queer Inhumanisms' (forthcoming), with gratitude to Harlan Weaver (2009) for the richly suggestive term "transmaterialities".

⁵⁰ Trinh Minh-ha, Keynote Panel for Gender and Women's Studies Conference, UC Berkeley, 2011, <<http://www.youtube.com/watch?v=xZv9WHaB1QI>> [12/03/2014], around 38 mins into the video.

⁵¹ Jacques Derrida, *Specters of Marx*, pp.25, 27.

⁵² Jacques Derrida, *Specters of Marx*.

⁵³ Jacques Derrida, *Specters of Marx*, p.99.

⁵⁴ Karen Barad, 'Quantum Entanglements', note 10, p.268.

⁵⁵ Gloria Anzaldúa, *Borderlands*, p.3.

⁵⁶ Jacques Derrida, *Specters of Marx*, pp.25, 27.

⁵⁷ Karen Barad, 'Quantum Entanglements', pp.248–249.

⁵⁸ See Jacques Derrida, *Specters of Marx* on hauntology; and Karen Barad, 'Quantum Entanglements'.

⁵⁹ For a detailed account of the quantum eraser experiment and its politico-ethico-onto-epistemological implications, see chapter 7 of *Meeting the Universe Halfway* and 'Quantum Entanglements'. Other key references on the quantum eraser experiment: Yoon-Ho Kim, R. Yu, S.P. Kulik, Y.H. Shih and Marlan O. Scully, 'A Delayed Choice Quantum Eraser', *Physical Review Letters*, 84:1–5 (2000); Marlan O. Scully and Kai Drühl, 'Quantum eraser: A proposed photon correlation experiment concerning observation and "delayed choice" in quantum mechanics', *Physical Review*, A25 (1982), pp.2208–2213.

⁶⁰ Gloria Anzaldúa, *Borderlands*, p.77.

⁶¹ Karen Barad, 'Quantum Entanglements', pp.260–261.

⁶² Jacques Derrida, *Margins of Philosophy*, trans. Alan Bass (Chicago: Chicago University Press, 1982), p.21.

⁶³ This is one way in which diffraction might be contrasted with (some forms of) critique, which is not to suggest that diffractive analysis does not have anything in common with critique, although questions of temporality and ontology figure

differently. As Foucault points out, in 'What is Critique?' (1978), critique is not one thing, but 'seems to be condemned to dispersion, dependency and pure heteronomy' (Michel Foucault, 'What is Critique?', in *The Politics of Truth*, edited by Sylvère Lotringer (Los Angeles, CA: Semiotext(e) 2007), p.25). Diffraction is indebted to forms of critical analysis such as those put forward by Marx, Nietzsche and Foucault. Indeed, both critique and diffractive analysis consider fundamental taking account of the (material-discursive) conditions of possibility in their historical-social-political-(naturalcultural) contingency. However, whereas critique operates in a mode of disclosure, exposure and demystification (see Eve Kosofsky Sedgwick, *Touching Feeling: Affect, Pedagogy, Performativity* (Durham, NC: Duke University Press, 2003)), diffractive reading might be understood as a form of affirmative engagement. Diffraction is an iterative practice of intra-actively reworking and being reworked by patterns of mattering. A diffractive methodology seeks to work constructively and deconstructively (not destructively) in making new patterns of understanding-becoming. See also, for example, Iris van de Tuin, 'A Different Starting Point, a Different Metaphysics: Reading Bergson and Barad Diffractively', *Hypatia: A Journal for Feminist Philosophy*, 26:1 (2011), pp.22–42 and Martha Kenney, *Fables of Attention: Wonder in Feminist Theory and Scientific Practice* (UCSC dissertation, June 2013).

⁶⁴ Karen Barad, forthcoming! The reference here is to this very paper. This may seem a bit strange, and the temporality will already be different once you read this, but it is a gesture to include what is also coming from the future.

⁶⁵ The author's names are added in brackets here in order to make the diffractive reading more evident while respecting the style of the journal.

⁶⁶ Gloria Anzaldúa, 'An Interview with Gloria Anzaldúa', conducted by Debbie Blake with Carmen Abrego, in *Iowa Journal of Cultural Studies*, 14 (1995), p.16.

⁶⁷ Karen Barad, 'Quantum Entanglements', p.261.

⁶⁸ Trinh T. Minh-ha, *Woman, Native, Other: Writing Postcoloniality and Feminism* (Bloomington, IN: Indiana University Press, 1989), p.120.

⁶⁹ Karen Barad, 'Quantum Entanglements', p.261.

⁷⁰ Trinh T. Minh-ha, *Woman, Native, Other*, p.123.

⁷¹ Karen Barad, 'Quantum Entanglements', p.264.

⁷² Loran Marsan, 'Creating New Spaces in Third Cinema: Trinh T. Minh-Ha Rewrites the Narrative of Nationalism With Love', 2011 <<http://truthseekers.cultureunplugged.com/truthlowbar;seekers/2011/09/creating-new-spaces-in-third-cinema-trinh-t-minh-ha-rewrites-the-narrative-of-nationalism-with-love.html>> [26/02/2014]

⁷³ Gloria Anzaldúa, *Borderlands*, p.20.

⁷⁴ Barad, 'Quantum Entanglements', p. 264.

⁷⁵ Jacques Derrida, *Specters of Marx*, p.xix.

⁷⁶ Karen Barad, 'Quantum Entanglements', p.264.

⁷⁷ Karen Barad, 'Quantum Entanglements', p.265–266.

⁷⁸ Trinh T. Minh-ha, *Woman, Native, Other*, p.128.

⁷⁹ Karen Barad, 'Quantum Entanglements', p.266.

⁸⁰ Trinh T. Minh-ha, *Cinema Interval* (New York: Routledge, 1999), p.233.

⁸¹ Karen Barad, forthcoming! [see note 64].

⁸² Trinh T. Minh-ha, *The Digital Film Event* (New York: Routledge, p.2005), p.34.

⁸³ Karen Barad, forthcoming! [see note 64].

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