



Transformations

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Beyond Bifurcation: Thinking the Abstractions of Art-Science after A. N. Whitehead

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Art-Science: From “Two Cultures” to Non-Representational Encounters

With modern science’s ability to understand and manipulate matter at the atomic scale, the invisible layers and processes of nature are having an increasing impact on our lives in the realm of the visible. Consequently, I think that we would do well to cultivate an intuition and sensitivity to the invisible, both as individuals and as a culture. It’s fascinating to speculate what might come about through this sort of heightened sensitivity to the invisible.... [W]hat if we could see ourselves inhaling the same atmospheric gas molecules exhaled by others? What if we could see the delicately correlated dances of tiny atoms, and how they responded to our own energy fields? (Glowacki)

“Where art meets science, making the invisible visible” declares the promotional tagline for the Bristol-based *danceroom Spectroscopy* project. For project leader Dr. David Glowacki and his collaborators, the installations of *danceroom Spectroscopy* are an attempt to explore the potentials of an encounter between contemporary dance and developments in nanoscientific visualisations to generate new material sensitivities to the interconnected dynamism weaving the invisible fabric of emergent nano-worlds. The creative experiments of *danceroom Spectroscopy* can therefore be considered within a broader and heterogeneous field of *art-science* collaborations, a field increasingly embraced within the contemporary literature as a crucial arena through which to challenge institutional and epistemic divisions between disciplines, as well as to generate new terms and practices for creatively responding to social, political, and environmental problems (Miller). As Georgina Born and Andrew Barry have recently highlighted, much of the contemporary thinking and practice of “art-science” continues to be informed by C. P. Snow’s famous “Two Cultures” lecture on the politico-economic and intellectual value of closing the “gulf of mutual incomprehension” between science and art (Snow 4). However, there is a tendency in contemporary interpretations of this “two cultures” discourse to narrowly frame art-science through representational logics of “communication,” which is often more about reaffirming already-existing boundaries and dogmas than it is about generating ontological shifts in our modes of thinking and engaging the world. Through an engagement with the installations of *danceroom Spectroscopy* in this paper, I want to explore how we might begin to think the “art-science nexus” differently, conceiving it less in terms of the communication of already-constituted terms and practices in pursuit of pre-envisioned ends, and more as a mutually transformative *encounter* of emergent and creative processes. Pushing beyond conventional understandings of the arts as representational tools of explanation or communication, I instead develop a non-representational sense of art’s encounter with science, one which sharpens an attentiveness in our thinking to the immanent forces and relations through which the art-science encounter becomes

implicated in the material production of capacities for thinking and feeling the world differently.

I argue that the philosophy of Alfred North Whitehead proves especially relevant here for thinking these non-representational potentials of art-science encounters. Following Whitehead, we might understand the contemporary emergence of art-science collaborations in part as a mode of response to the ongoing “professionalisation” or “grooving” of thought resulting from what Whitehead identified as the “bifurcation of nature” (Whitehead, *Concept of Nature* 29). [1] The central aim of Whitehead’s speculative philosophy was always to overcome this bifurcation of nature, which he understood as the fallacious metaphysical doctrine that works to separate Nature into two mutually exclusive realities: the objective domain of bare matter (the physical scientist’s world of agitated electrons and molecules) and the subjective experience of mind (the radiant glow and warmth of the sun, which become the “minor artistic additions” of the human subject) (Whitehead, *Concept* 43). Whitehead’s diagnosis of bifurcation, as Isabelle Stengers has recently argued, has particular significance for contemporary theory through its elaboration of the processes in experience through which the divergent ways in which the world and ourselves matter become a series of oppositions (nature / culture, body / mind) and as such food for judgement and disqualification. This bifurcation of modes of thought is especially evident in our dominant, institutional representations of “Art” and “Science,” which typically stage hierarchical oppositions between their speculative methods and approaches – or the arts as the domain of subjective experience and enjoyment, and the sciences as the domain for the objective workings of experiment (McCormack).

What makes Whitehead’s response to this problem of bifurcation so productive is that it provides an antidote to much contemporary philosophy, which remains informed by the phenomenological attempt to reconnect consciousness to a natural world that has been split by the “scientific worldview” (Shaviro). Within the Heideggerian-inspired phenomenological tradition, the sciences are typically imagined as instruments inextricably tied to ontic realms, encountering other entities as “present-to-hand” in a way that presents the natural world as “a barren, metaphysical place of matter in motion, divorced from human subjectivity, conscious experience, and embodied life” (Robinson 7-8). This critique of science within phenomenology thus presupposes a rather fixed and static view of natural science, as if the sciences were inescapably bound to mechanistic and reductionist modes of thinking. Whitehead’s approach to science, however, is far more nuanced than the phenomenologists’ – you can’t undo the bifurcation of nature, he argues, by simply dismissing one side of the dichotomy. Whitehead’s point is that the kind of scientific and technical reductionism deplored by the phenomenologists is in fact one (albeit powerful) mode of “abstraction” (Whitehead, *Science and the Modern World*). Drawing on the theoretical lexicon from his academic background in mathematics, Whitehead describes abstractions as processes that “vectorise” experience, by which he means a process that carves out from the fragmentary and disorderly continuum of concrete experience the limited and narrow aspect of certain defined objects (Whitehead, *Process and Reality* 231). Abstractions, for Whitehead, are what make our experience matter in a selective way through the foregrounding and backgrounding of different elements in sense-awareness, activating some forces and potentials while closing down others. Abstractions in this sense are therefore indispensable to life, constituting the very conditions of possibility for thought and action. An awareness of the effects of abstractions then should not lead to their dismissal in favour of an appeal, like in phenomenology or critical theory, to a supposedly “truer” or “more concrete” form of experience. Drawing inspiration from Whitehead, Brian Massumi argues that the problem for social theory today is not that our thought is too abstract, but rather that it is often “not abstract enough” to grasp the concrete potentials for difference and becoming in the world (*Parables* 5). When tethered to representational forms and universals that presuppose language, thought is rendered incapable of accounting for other material processes and nonhuman forces in experience. Acting to “lure” thinking and feeling towards certain elements in experience, abstractions thus become reimagined in the thought of Whitehead as sites of creative experiment within worlds of process, with the potential to “induce empirically-felt variations in the way experience comes to matter” (Stengers

96).

I begin in the following section by briefly outlining some of the key concepts in Whitehead's speculative philosophy. In particular, I highlight how his concept of "abstraction" affords opportunities for thinking in more non-representational and ontogenetic terms about the ethical potentials of the art-science encounter to modify capacities for thinking and being affected by other forces and agencies in the world. Through an engagement with the nanoart installations of *danceroom Spectroscopy* in the final sections of the paper, I explore the capacity of art-science encounters to creatively engage artistic (cinematic media visualisations), scientific (concepts and simulations of the nanoscale and molecular fields), and corporeal (the intensities and forces of dancing bodies) abstractions in ways that generate new potential individuations of bodies and subjects. Thought through the conceptual lens of abstraction then, I contend that what is at stake in the art-science encounters of *danceroom Spectroscopy* is the production of new material sensibilities that open creative ways of responding to the novel arrangements of thought, matter, and technology that define the emergent worlds of nano-science.

The Philosophy of Whitehead: Process, Feeling, Abstraction

In recent years, a number of scholars have sought to explore the implications of Whitehead's metaphysical project for contemporary thinking, foregrounding in particular his contribution to debates around nonhuman agency (see Debaise; Roberts), speculative realism and materialisms (Shaviri; Halewood), and the ethics and politics of affect (Manning and Massumi; McCormack). Despite writing his major philosophical works in the 1920s and 30s, Whitehead's thought has proved especially relevant for contemporary scholars writing on environmental change, globalisation, and the emergence of the "posthuman" because of its affirmation of the interrelatedness of all (human and nonhuman) entities, and its understanding of the way in which their encounters constantly lead to consequences that are new and unforeseen (Shaviri). At the heart of Whitehead's speculative project, then, is the attempt to untether Western philosophy from its ongoing adherence to "subject-predicate forms of thought," and from the anthropocentric terms of reference that follow from this (Whitehead, *Process and Reality* 3). Instead, Whitehead proposes a generalised, non-Cartesian metaphysics that affords the same ontological status to "throbs of pulsation, molecules, stones, lives of plants, lives of animals, lives of men" (Whitehead, *Modes of Thought* 86).

One of Whitehead's key innovations in the history of Western philosophy is to affirm a world made up of nothing but events: of occasions rather than objects, processes rather than substances, verbs rather than nouns (Deleuze). Orienting his thought around this conceptual logic of the event, Whitehead thus strives to avoid the philosophical habit of positing an originary bifurcation between a world of physical objects (seen as the arena of analytical science) and thinking and feeling subjects (the domain of the arts). In Whitehead's metaphysics, subjects and objects are no longer originary or primary, but instead come to name emergent effects within the material process of experience itself. In seeking to avoid a bifurcated view of the world, Whitehead's speculative philosophy does not abandon the category of the subject (as in contemporary forms of speculative realism and "object-oriented" ontology), but instead "reforms" it as a general metaphysical process in the constitution of all entities in the universe (*Process* 62). For Whitehead, every actual entity, whether living or nonliving, is "essentially dipolar with its physical (objective) and mental (subjective) poles," and he argues that these mental operations do not necessarily involve forms of consciousness, but instead constitute the self-determining manner of an entity's creative actualisation that introduces a novel hesitation into the actions of efficient causation (*Process* 239). Subjectivity then no longer corresponds to a specific human substance or experience, but rather names the process of becoming from potentialised past to indeterminate future that constitutes the singular difference of an entity or event.

Through this ontological extension of experience and subjectivity beyond human consciousness, Whitehead goes on to argue that every entity – from the philosopher gazing at the sunset to an

electron orbiting around a nucleus – is a *feeling* of its world. In the case of the electron, its “feeling” of the electromagnetic field of the atom is not “conscious” of course; but it is affected by the quantum pull of this field, and it is precisely this “being affected by” – this selective admission into experience of certain elements and potentials – that constitutes for Whitehead the event of feeling (Shaviro 55). For Whitehead, “feeling” becomes a metaphysical process describing how all entities interact and affect one another, and the manner in which the feeling entity is affected or changed by this process becomes the very content of what it feels (*Process* 221). Importantly for Whitehead, and as highlighted by his concept of the “subjective form,” every process of feeling is a singular event, involving the creative elaboration and transformation of the forces and potentials that are encountered (*Process* 221). It is through this notion of feeling as a process involving the selection, contrast, and intensification of sensory data that Whitehead argues there is *artfulness* to every experience, but whereas habitual, “everyday” experience tends to foreground the object-oriented pole that guarantees the flow of instrumental action, artistic experience for Whitehead involves the foregrounding of the dynamic and relational pole of experience that increases an event’s “intensity of feeling” (*Adventures of Ideas* 252). If feeling can be understood as the process of “taking-account” of other elements of experience, then what defines the art-encounter is its capacity to broaden the ontological field of this taking-account in ways that allow other immanent relations and forces to appear. Following Whitehead then, we might reframe the transformative potential of art in terms of its capacity to disrupt habitual modes of experience, acting to “lure” thinking and feeling beyond the representational territories of the already-familiar.

However, and in contrast to the interpretations of some contemporary authors (e.g. Harman), Whitehead’s recognition of the evental processuality of experience is not an appeal to a thought that would dissipate the world into a flux of chaotic disorder. Whitehead’s thought is explicitly attentive to the question of how certain patterns of thought and perception cohere and hold together, but his crucial point is how to account for this ordering in absence of the transcendent subject or consciousness of representational and phenomenological thinking. To think the immanent and emergent conditions for this organisation of experience, Whitehead has recourse to the concept of “abstraction.” As a number of authors have recently highlighted, Whitehead’s ontogenetic understanding of abstraction as an irreducible part of the material becoming of the world challenges the more pejorative conception we find at work in conventional forms of critical social theory (see Toscano; Goffey; McCormack). Within critical theory, abstraction has typically been understood as an *epistemological* process through which thought and action withdraws (or, under capitalism, is forced to withdraw) from the energetic forces and sensate ecologies that are the conditions for its emergence and flourishing. Underpinning this critique of abstraction in critical theory then is the assumption of a bifurcation between the supposedly disembodied and indifferent logics of “abstract thought” and the lively process of “concrete nature” (McCormack). Whitehead’s philosophy, on the other hand, refutes this hierarchical opposition between the abstract and the concrete, and is thereby deeply suspicious of any philosophical call to recover the concrete reality of experience against its falsification by abstract interpretation. Furthermore, Whitehead challenges the tendency to imagine abstraction as a transcendent form of distinctly human thought, conceiving it instead as a metaphysical process immanent to the material relations of nature. Abstractions following Whitehead are thus no longer simply conceptual or mental operations like in conventional epistemological interpretations, but are material processes implicated in, and expressive of, the becoming of nature. In refusing to place human thought as ontologically central or originary, Whitehead writes that “abstraction expresses nature’s mode of interaction and is not merely mental. When it abstracts, thought is merely conforming to nature – or rather, it is exhibiting itself as an element in nature” (*Symbolism* 26). [2] Rather than adopting the critical theory strategy of denouncing abstractions or attempting to “explain them away,” Whitehead argues that “we are quite literally infected by abstractions” which disclose and give consistency to different kinds of worlds (Goffey 27). To think with Whitehead then, as Stengers argues, is to reconceive abstraction as that which moves us to thought, “luring” thinking and feeling in ways that can enhance our capacities for sensing difference rather than necessarily

inhibiting them (96). What Whitehead makes possible through his rethinking of abstraction as a crucial element of thinking and acting within worlds of becoming is a new sense of the task of a “philosophical critique of abstraction,” which would be an account of the kinds of creative work they do in the world: what new thoughts and feelings they make possible, as well as the relation of those abstractions to the unactualised potentials they selectively elide or deny.

In *Process and Reality*, Whitehead thus argues for the importance of remaining vigilant against the ossification of abstractions in response to encounters with the new, and advocates the importance of creatively experimenting with them in ways that make us more responsive to the novel potentials in a field of activity. To experiment with abstractions then, as Stengers writes, is to experiment with their potential to transform habits of thinking and being; it is what she terms an “ethopoietic test ... concerned less with the production of new definitions for what we consensually perceive and name, than with the capacity to induce empirically-felt variations in the way experience comes to matter” (96). [3] Whitehead himself highlights the ethopoietic potential of experimenting with techniques of abstraction in philosophy and art (specifically poetry) for the “disclosure” of other possible worlds and the invention of new material sensibilities (*Modes of Thought* 49). Whitehead’s philosophy thus implicates the becoming of thought and bodies within the world’s material process, re-directing our attention towards ecologies of nascent abstractions that present opportunities for creative experiment with different immanent forces and potentials. The encounter with the art-science experiments of *danceroom Spectroscopy* in the following section thus seeks to open a broader appreciation of the sites, techniques, and processes through which abstraction works to generate new possibilities of thinking, feeling, and being.

Thinking the Invisible: the Art-Science Encounters of *danceroom Spectroscopy*

Physicists and chemists have dissolved the simple idea of an extended body, say of a chair, into a bewildering notion of a complex dance of molecules and atoms and electrons and waves of light. (Whitehead, *Aims of Education* 118)

Following the hugely popular launch of their interactive installation at the Arnolfini (Bristol, UK) in 2011, the team of *danceroom Spectroscopy* have staged a number of experimental collaborations with contemporary dancers (*Hidden Fields*, 2012-present), musicians (*Molecular Music*, 2013), and classical composers (*Bristol Proms*, 2013-2014) in an attempt to visualise and sonify the imperceptible and inaudible world of the nanoscale. [4] Combining supercomputer simulations of nanoparticles, cutting-edge 3D visualisations, and motion-capture technologies, their interactive installations transform human bodies into dynamic energy fields on-screen that attract and repel surrounding nanoparticles. Oriented against reductive understandings of the molecular universe and discrete conceptions of the human body, the installations of *danceroom Spectroscopy* explore the potential of art-science encounters to enact a creative leap in our habits of thought and to generate new capacities through which both science and culture might begin to “think process.” Glowacki foregrounds the important challenge of cultivating modes of thinking the world in the reality of its creative process in the context of contemporary nanoscience interventions when he writes:

It’s always been a challenge for scientists to think and visualise the invisible molecular world. We have grown accustomed to imagining molecules using stationary snapshots or “ball-and-stick” representations, but this is profoundly misleading. Invisible molecules are actually dynamic and perpetually changing. They are engaged in a delicate dance that depends on how their energy fields interact with their surroundings. (Glowacki)

What Glowacki identifies here as the problem of how to think the natural world beyond the prevailing image of a static and lifeless domain of matter at an instant is also the point of critical departure for Whitehead’s philosophical project against the “vicious principle of bifurcation” at

the heart of the abstractions of scientific materialism (*Concept* 187). Scientific materialism, Whitehead writes, commences from the ontological presupposition that reality is “composed of bits of matter and discrete objects, enduring self-identically, and moving about a space that is otherwise empty” (*Modes* 128). What this gives rise to is a thought of the material world under the static abstraction of what he terms “Nature Lifeless” – a Newtonian universe of physical causality devoid of any creative difference, sense or novelty (*Modes* 135). Writing at the dawn of the twentieth century during a period of great transformation in scientific understanding, Whitehead was well aware that this abstraction of thinking the natural world was becoming increasingly untenable. For Whitehead, the emergence of Einstein’s theory of relativity, and the subsequent shift from classical to quantum mechanics, were giving rise to new conceptions of “an entangled universe shot-through with relations that exceed the here-and-now of Newtonian mechanics” (Roberts 971). However, and despite its increasing rejection by the scientific community, Whitehead still saw scientific materialism as a harmful and illegitimate abstraction infecting the entirety of cultural life, noting that “the enduring self-identity of a house, of a farm, of an animal body is presupposition of social discourse [and] lies at the base of all literature” (*Modes* 128). Nature thus bifurcates when we fail to understand this thought of a material world of brute matter and discrete objects as a restrictive abstraction from the ontogenetic flux of the world’s process.

To counter this tendency of modern thought to reduce nature to a bifurcated logic of subjects and objects Whitehead’s philosophy demands an imaginative leap: neither object nor subject, but *process*. For Glowacki, the new experiences and encounters generated through the artistic techniques of dance and cinematic visualisation play an integral role here in enabling us to develop material sensitivities to the interconnected process of the invisible world of the nanoscale. Indeed, Glowacki notes how a growing number of molecular scientists are drawing on the vivid conceptual ideas and lexicon provided by performance art and dance as a provocation to think about the energetic dynamism of atomic worlds (see Flink and Odde). However, I argue that the thought advanced in this scientific literature regarding the potentials of art remains tied to the semiotic domain of its figurative meaning, with art understood simply as a representational form for the communication of the “content” of science (Hynes). The difference with *danceroom Spectroscopy* is that dance and visual media in their interactive installations are more than just tools of communication, and instead become sites of intensive encounter that transform bodies and their capacities for thinking and relating to the nonhuman world.

At stake in encounters with the art installations of *danceroom Spectroscopy*, I argue, is the possibility of opening thought and action to new intensive registers and nonhuman dimensions of experience. An important emphasis of *danceroom Spectroscopy*’s work to date has been on the creative potentials of interactivity, with the public frequently invited to interact with the technology through events like the “Energy Flow Seminar” which gives participants the chance to playfully experiment with the possibilities of movement and relation between their energetic fields of light. For example, during the interactive seminar participants are encouraged to trace with the movement of their bodies the ebb and flow of the nanoparticles on the screen at an ever-increasing speed. As the moving configuration of bodies in the installation space shifts to a more frenetic pace, the path-lines of bodies increasingly cross and collide, sending erratic particles flying. Such experiments in “moving like a particle” can be understood as creative techniques that generate alternate modalities of relational thinking and awareness: no longer oriented around an attentiveness of thought *to* the world (which would cast a pre-composed subject standing over a field of discrete objects already oriented for use and action), these modalities propose an immanent thought *of* the world (of the preindividual forces and affects in experience that do not yet distinguish between subject and object, human and nonhuman). The provocation to thought staged in the Energy Flow session is thus how we might attempt to think experience beyond the action-oriented habits of human perception, which apportion-out discrete bodies and isolated objects from the world’s creative process. What the installations of *danceroom Spectroscopy* emphasise instead is a field of experience not composed of static objects, but rather by immanent

intensities and spaces of the “in-between,” the fleeting “openings” and “pathlines” that are the singular and ontogenetic conditions for the appearance of these objects (Deleuze 20). As Manning and Massumi write, these emergent openings are thus not defined negatively by a lack of something occupying them, but are instead “positive expressions of how everything, moving and still, integrally relates at that instant.... It is the appearance of the field’s relationality from a particular angle” (9). They express what Whitehead terms a “perspective of the universe”: a certain relational pattern of experience that still intensely flickers with other expressive tendencies that our habits of attention so easily gloss over (*Modes* 66). Through the art-encounter the field of immediate experience appears for itself, bringing to the foreground of perception the forces of experience’s self-composition and the emergent relations of colour, light, sound, particles, and bodies it instantiates in the world.

This performative disruption of action-oriented habits of perception is perhaps most affectively expressed through the encounter with moving bodies in the dance show, “Hidden Fields” (2012/2013), in which dancers perform gestures and movements that attempt to creatively sculpt the nanofields in which they are immersed. As highlighted recently in writings on dance, and in contrast to representational interpretations, the art of dance is not just about the identification or communication of something (be that the subversion or reproduction of extant knowledges, social discourses, or identities), but is instead its own generative event implicated in the production of intensive territories and bodies that “abstract” different qualities and singularities from thought and movement (Dewsbury 56). We can see this more non-representational sense of the task and possibilities of dance at work in the Hidden Fields performance, in which the dancers’ bodily postures and gestures are not simply attempts to imitate or reproduce the movement forms of nanoparticles and their energetic fields, but rather to creatively propagate this movement by other affective and expressive means. From a Whiteheadian standpoint, the artistry of the dance here, as Stamatia Portanova notes, is its capacity to disrupt, modulate, and bend “the limits of anatomical principles and functions through the daring abstractness of an idea” (i.e. “to move like a nanoparticle”) (25). However, what the performative enactment of this idea in the dance-event of Hidden Fields brings to the foreground of perception are not the actual movements of the dancers or the movements of the nanofields on-screen, but rather the dynamically emergent modes of “subjective form” that intensively bind their capacities and tendencies of movement (Whitehead, *Process* 85). What the audience are forced to think and feel in the encounter with dance then are the “abstract dynamics” of this relational movement, which do not replace the actual forms that we see, but rather express the creative forces that constitute the body’s virtual potentiality for future becomings (Massumi, *Semblance* 43).

Following Whitehead, what is affirmed in the artistic encounters with movement in both the Energy Flow and Hidden Fields events is not a static perspective *on* the universe. The subject of the artistic experience is not the discrete human body that would stand over and above the event, but rather it is this body that emerges as a relational conduit for the indeterminate forces and potentials composing the expressive event of experience. The “subjective form” for Whitehead, as we saw earlier, instead names the dynamic form of this co-activity which constitutes the singularising difference of the event (*Process* 85). This is certainly not to deny the important role of human bodies in the artistic installations of *danceroom Spectroscopy*, but it is to reimagine the body in a way that challenges a certain style of representational thinking that positions the human percipient as sufficient alone to account for the expressive culmination of an experience. Following Whitehead, and as Massumi highlights, the body can be understood as a material technique of abstraction, one which selectively channels the incessant, nonhuman activity of a world of process into its own distinct form of experience and activity (*Semblance*). What this thought of the body as a technique of abstraction opens is a radically non-cognitive and non-phenomenological understanding of the process driving the foregrounding and backgrounding of elements in experience. Approaches to the subtractive process of perception in the humanities literature have often turned to phenomenology as a means to restore the qualitative diversity and richness of experience (cf. Ahmed). For phenomenology, however, the field of immediate

experience can only be thought as always-already subjective, in the sense here of being already imbued with a specifically “human” meaning that is merely waiting to be disclosed. In contrast, what Whitehead makes possible is a thought of bodily feelings and perceptions not as distinctly “human” processes for phenomenological translations of “implicit knowledge” into an explicit embodied schema, but instead as intensive milieus of indistinction between human and nonhuman forces and processes “in the midst of which a human experience comes to find itself” (Massumi, *Semblance* 27). Whilst the human bodies within the artistic installations of *danceroom Spectroscopy* do not of course physically feel the imperceptible vibrations and collisions of nanomolecules, the interactive fusion of body-movements and their digital rendering on-screen as shifting nanofields serves to generate capacities for perceiving the abstract forces that intensively resonate across human and nonhuman domains of experience.

For Whitehead, experience is a processual continuum in which a multiplicity of tendencies and forces are present as “general” potentiality, but which are differently abstracted into spatio-temporal configurations that express different relations of these potentials (*Process* 65). What Whitehead makes possible is a thought of how the art-encounter exists in immanent and inventive continuity with the material process of experience (Parisi and Goodman). The transformative potential of art lies in its potential to “re-abstract” habitual processes of thought and perception in ways that interrupt the forces and relations that ordinarily orient thought and action (Massumi, *Semblance* 57). What the art-encounter produces then is a creative movement that taps into the abstract domain of imperceptible relations and unthought intensities to make manifest new potentials of experience that transform bodies and their capacities of thinking and feeling.

Conclusion

This paper has explored the contribution of Whitehead’s philosophy and the art-science experiments of *danceroom Spectroscopy* to a new thinking of the transformative logics and potentials of art-science. Here, I argue, the emphasis shifts from the logic of communication that underlies conventional accounts (in which the encounter of art and science is reduced to the possibility of establishing “disciplinary bridging” between forms of knowledge and practice) towards a logic of individuation concerned with the potential of such encounters to generate new material relations of thought and bodies. In particular, I foregrounded Whitehead’s thinking on “abstraction” as a concept that opens thinking to emergent forces and processes that play out below the bifurcation of “Art” and “Science” into the institutional forms that capture their creative energies and judge them according to the criteria of the already-existing. One of the key implications of Whitehead’s philosophy is thus how it refocuses the attention of those of us thinking and working in the art-science nexus to affirm and cultivate modes of practice and encounter that exceed the ready-made channellings of disciplinary thought and practice in ways that activate other creative possibilities of life.

This is an especially important challenge in light of the increasing prioritisation of transdisciplinary, art-science collaborations by academic institutions and funding bodies, as well as the increasing sophistication and accessibility of scientific tools and software and techniques of visualisation. Within the field of contemporary dance, for example, a growing number of choreographers have sought to experiment with the possibilities afforded by new motion-capture and visual mapping technologies to transform how we might think and experience movement (see Mitoma et al). However, and as Erin Manning notes, there is often a tendency in such dance-technology encounters to become enthralled by the “science-event” such that we lose sensitivity to the new potentialities of movement and bodies generated by what she terms the “art-event” (125). Through a representational emphasis on the capabilities and contributions of scientific technologies over a thought of the new affective qualities of movement then, these dance-technology experiments tend to remain attached to the utilitarian and anthropocentric question of “what can science do?” Here, technology thus becomes framed as a kind of prosthetic addition to

experience that would open the human body to new qualities and sensations of movement.

Art, on the other hand, asks a different question. Here, the utilitarian question of corporate technoscience becomes the ethical question of bodily becomings: what can the body do? It is this artistic conception of the body as a site of ethical experimentation that I think is forcefully highlighted in the practices of *danceroom Spectroscopy*, which cultivate a sense of the body not as a stable form but as a relational process that cannot be separated from the technical milieus and nonhuman forces that compose and move it. This relational staging of the body in the art-science encounter demands a reorientation in our thinking of the relation of bodies and worlds: from a thought of the body as a discrete entity located in a preformed world, to a thinking of the world as emergent process that becomes through the relational encounters and movements of human and nonhuman bodies (Lapworth). Rather than investing in the bifurcated hierarchy economy of subject and object, what is foregrounded by *danceroom Spectroscopy* is a conception of the body as an emergent event interweaving inorganic and technical sensations into movements that intensively transform the individuation of worlds. What the assemblage of motion-capture and visualisation technologies in the installations of *danceroom Spectroscopy* render visible are not just bodies in movement and their nanoscale representations, but the imperceptible sensations and relations that cut across human and nonhuman registers of experience. In contrast then to a staging of an “interaction” in which the capabilities of science and technology become the event in and of itself, the eventual potentials of the art-science encounter might instead be defined, following Whitehead (*Process* 185), in terms of the “lures for thinking and feeling” it activates in reconfiguring old and accessing new relations with the nonhuman world.

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Endnotes

1. This is not to say that the non-bifurcated logic of thinking “art-science” I identify in this paper is at play in all contemporary art-science collaborations. In fact, and as Born and Barry have argued, the rationale provided by institutions and funding bodies for supporting spaces and practices of art-science are often narrowly framed by one of two main interdisciplinary logics that continue to invest in this bifurcated hierarchy of Art and Science: a *logic of innovation* in which art-science practices are justified in terms of their capacity to develop new commercial products and prototypes that can help fuel the neoliberal “creative economy” (see Edwards for a quintessential example of this mode of thinking in practice); and a *logic of accountability* that typically dominates social science understandings of art-science, in which art is conceived as a tool of “public engagement” through which to transform society’s relationship to science. Common to both these logics of thinking the art-science nexus then is a sense of “transdisciplinary encounter” in which both art and science would continue to operate in accordance with their already-established terms of reference and disciplinary methodologies, meeting only on the terrain of research outputs and deliverables in ways that do very little to generate transformations in existing

habits of thinking and doing. In staging an encounter between the art-science experiments of *danceroom Spectroscopy* and the philosophy of Whitehead, my aim in this paper is to amplify how we might inhabit the interstices of art-science differently, pushing beyond the bifurcated logics that dominate conventional discourse towards a thinking of the art-science encounter as an ontogenetic and immanent event that engenders new possibilities of thought and life.

2. In attempting to move beyond the epistemological sense of abstraction as a kind of disembodied knowledge, one withdrawn from the dynamism of matter, Whitehead returns to the etymology of the word "abstraction" as "*ab-trahere*" (Rajchman). This Latin word refers to the dragging off, or drawing off, of a thing; the moving of a thing from one place to another. The meaning of "*trahere*" is thus closer to that of "traction," with the adjoining prefix "*ab*" denoting "away from." The work that Whitehead is making of abstraction then is thus concerned with an ontological movement and immanent selection of things, and which therefore does not only refer to the process of thought of a human subject (Halewood).
3. This term "ethopoietic" in Stengers's work combines the sense of "ethos" (as mode of being or way of living) and "poiesis" (to create), and thus highlights the potentials of experimental encounters with abstractions to transform habitual modes of thinking and being.
4. More on the art and science of *danceroom Spectroscopy*, including information on forthcoming events and publications, can be found on their website <<http://danceroom-spec.com/>>

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