

Science and Performance: The(or)atrical Entanglements and Hauntological Relations

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Act I. Scene I. Entanglements: Physics by Way of Performance¹

In her article “Quantum Entanglements and Hauntological Relations of Inheritance,” feminist philosopher of science Karen Barad goes to the theatre to think the “spacetime (re)configurings” of quantum physics (2010, 240). In “Act 1 Scene 1,” Barad restages a private conversation in Copenhagen in 1941 that took place between German physicist Werner Heisenberg and Danish physicist Niels Bohr. She does this by way of a theatrical imagining of the two physicists (as actors) speaking (as ghosts) in the 1998 play *Copenhagen* by Michael Frayn. In this speculative performance of the possible conversation that took place between the scientists in Nazi-occupied Denmark, the spectral Bohr and Heisenberg meet in 1941 via the 1998 play in a 2010 article to debate the ethical implications of an atom bomb. In Barad’s writing, the actors playing ghosts in *Copenhagen*, in turn, return “for the first time, again” (243) in yet another section of the 2010 article headed “Act 1, Scene 1.” This time(s), they appear through the ghostly actors in *Hamlet’s* 1600 Copenhagen, but not before crossing times with Bohr’s development of quantum physics in 1927 Copenhagen, which finds its untimely future-(not-yet)-past in 1945 when the United States drops atom bombs onto Hiroshima and Nagasaki:

war time / science time / spacetime / imaginary time / mythic time / story time / inherited time / a time to be born / a time to die / out of time / short on time / experimental time / now / before / to-come / . . . threaded through one another, knotted, spliced, fractured, each moment a hologram, but never whole . . . (Barad 2010, 243)

In this heterogeneous history of the field of physics, Barad diffractively plays multiple times together-apart within and across a quantum field of “spacetimemattering.” In so doing, Barad *enacts* quantum field theory. She puts Bohr’s theory of complementarity into play, showing how time is not simply given, nor does it come to pass. Time is *made* and *marked* through material-discursive practices. This is one of Bohr’s key insights: concepts such as time do not refer to fixed or stable things in the world. Instead, time is a “specific material arrangement of experimental apparatuses” (Barad 2010, 253), and it is one that leaves marks.

It is not merely that the future and the past are not “there” and never sit still, but that the present is not simply here-now. Multiply heterogeneous iterations all: past, present, future, not in a relation of linear unfolding, but threaded through one another in a nonlinear enfolding of spacetimemattering, a topology that defies any suggestion of a smooth continuous manifold. Time is out of joint. Dispersed. Diffracted. (Barad 2010, 244)

I begin with Barad’s 2010 article “for the first time, again” in this 2017 introduction because it does science as, in, and through theatre. But why go to the theatre to do physics? As Hamlet reminds us, “the play’s the thing” (Shakespeare 1963). The theatre is an experimental apparatus for spacetimemattering *par excellence*. Theatre is a temporally heterogeneous and spatially heterotopic field that threads past, present, future together in dis/continuous here-nows and there-thens (Schneider 2011). In *Copenhagen*, a 1941 conversation in Copenhagen between two dead physicists is

played “live” across the bodies of two living actors who are not the dead physicists, but are not-*not* the dead physicists whom they body forth in the act of surrogation.² This happens again every time *Copenhagen* is staged in the layered present of a live performance; a conversation in 1941 Copenhagen takes place “for the first time, again” on stages in 2016 Los Alamos, 1999 Manhattan, 2018 Geneva. And while this conversation is a fictional rendering of a historical event that took place—that is, while this conversation, as it is written, never “happened” as a matter of historical record—when it is played on stage, the fictionalized event really *does* take place *again* and *for the first time*. As a matter of record and as a record of matter, it *actually happens*.³

Quantum theatre theory, the(or)atrical physics. Time is out of joint.

Copenhagen/Copenhagen is haunted by its own internal fracturings/disjunctures that belie the presumed unity of places, spaces, times, and beings. A ghost that is the very specter of multiplicity itself haunts the play and the interpretation (of quantum physics that goes by the same name). *What if the ghost were taken seriously?* (Barad 201, 263, emphasis mine)

Theatre and performance haunt science as onto-epistemological practices and experimental apparatuses of spacetime-mattering. This special issue is about, to borrow a phrase from Sarah Klein and Tyler Marghetis’s article, “taking [this ghost of] performance seriously and literally.” The hauntological relation of theatre to science and the performative promiscuities at play in scientific assemblages move centre stage in the different here-nows and there-thens of the textual, sonic, and visual materials that compose this issue.

Act I. Scene I. The(or)atrical Physics (In Which We Take the Ghost Seriously)

Stage Right:

[London, 1660] The ghost of Robert Boyle stands before a crowd of witnesses at the Royal Society. Boyle is staging an “experimental performance” for a number of guests (Shapin and Schaffer 1985, 30). Boyle stands beside a large contraption with a glass chamber at the top. Inside the chamber is a small bird. By pumping a gear on the side, Boyle attempts to make air visible and to demonstrate that air is connected to the maintenance of life. As the pumping slowly creates a vacuum, spectators can see air through its absence: the twitches, spasms, and gasps of the animal as it begins to suffocate. By breaking the seal, and letting air back in, the animal can be resuscitated.

Some people are amused, others appalled. Some leave. Others applaud. Boyle and members of the Royal Society are in the early throes of institutionalizing and standardizing experimental science. Performance is a key mechanism in the constitution of a matter of fact as Boyle sets the stage for spectators to experience that air is matter and the absence of matter is a vacuum.

Center Stage:

[Vancouver, 2017] The experimental sciences are marked by a deep and enduring theatrical convention of publicly staging experiments for spectators (Shapin and Schaffer 1985; Latour 1993; Hilgartner 2000; Morus 2010; Smith 2014). According to the *Oxford English Dictionary*, a “fact” is “a thing done or performed” or “the making, doing, or performing,” as in the very process of accomplishing a proper knowledge object *as* itself.⁴ In their history of the emergence of the experimental sciences in seventeenth-century England, Shapin and Schaffer show how early experimentalist Robert Boyle drew on theatrical practices in the constitution of a matter of fact,

from the explicit staging of experiments for a witnessing public to the “mimetic technologies” such as written scripts and protocols that allowed matters of fact to be replicated and their publics to be expanded (1985). Georges Canguilhem has described the laboratory in theatrical terms as “a place where artifices intended to make the real manifest are worked out” (1977, 73). And Bruno Latour illustrates how Louis Pasteur moved microbes from the real-artifice of his laboratory into the public domain through dramatizing his experiments in a “theatre of proof” (1977, 85).⁵ In his play *Gaia Global Circus*, Latour has also turned to the theatrical stage as an experimental space uniquely suited to thinking through the layered times, materials, scales, lives, feelings, knowledges, worlds, and imaginaries at stake in climate change. In this work, theatre emerges as a practice of world-making and knowledge-making that is tightly interwoven with science, politics, and society. Latour’s move to take theatre’s hauntological relations to the sciences seriously marks a welcome and compelling departure from the works of many historians and theorists of science. While scholars in this field have generally embraced the theatre as a metaphor and model for scientific practice, they have shied away from theatre theory and practice, often reducing theatre to a “mere” representation of the world in opposition to the world-making “productivity” of performance. In this oppositional framework, theatre “shows” while performance “does.”

There is a similarly rich history in theatre studies of tracing the traffic from science to theatre, from texts that explore how scientific theories, histories, or debates are conveyed in theatrical performances (Goodall 2002; Lustig and Shepherd-Barr 2002; Shepherd-Barr 2006; Bartleet and Shepherd-Barr 2013) to the influence of scientific theories of embodiment and emotion on theories of acting (Roach 1993). More recently, theatre scholars have become more attuned to the “two-way street of mutual influence” between science and theatre (Shepherd-Barr 2015, 3). This shift is most readily exemplified in the uptake of cognitive neuroscientific theories and methods to explore shared questions of affect and embodiment in theatre (McConachie and Hart 2010; Shaughnessy 2013; Blair and Cook 2016). Yet, as contributors to this special issue argue, for all of the richness of these theorizations of the traffic between science and theatre, many theatre and performance scholars have “glossed over the performed, practical, and situated features of science itself in favour of working with compatible frameworks and concepts that organize zones of shared interest and mutual exchange” (Klein and Marghetis 2017, 16). With the notable exception of Tiffany Watt Smith’s excellent 2014 book on the theatricality of Victorian-era scientific looking in the work of Charles Darwin among others, practices of scientific knowledge-making remain largely uninterrogated within theatre scholarship. In this way, theatre risks falling back into the trap of simply conveying, transmitting, rehearsing, or staging a “black-boxed” science,⁶ and scientific theories of embodiment and emotion are called on to legitimate, explain, or inform theatrical techniques such as actor training without accounting for the theatrical entanglements, embodied relations, and historical contingencies of scientific practice itself. As Klein and Marghetis observe, this process by which science is made to speak truth to theatre, while the performative and bodily practices of science are obscured, is in danger of reinscribing mind-body dualism and undervaluing embodied modes of knowing (35).

In the video and text of “Analyzing the Analyst” in this issue, Yelena Gluzman beautifully develops a research methodology that takes theatrical, social scientific, and cognitive neuroscientific approaches to embodiment as interconnected, yet non-equivalent modes of experimental inquiry. Gluzman choreographs an empirical research project that works from *within* an interrelated field of concerns, practices, and sites for performing bodily interactions *in* and *as research* in innovative ways. Gluzman’s video project draws together recordings of an interaction between strangers in a gallery as part of a participatory art installation (*your position*), footage of Gluzman and cognitive

neuroscientist Jaime Pineda in a lab analyzing the recordings of the gallery interaction, and rehearsal scenes in which actors re-perform Gluzman and Pineda's analysis of the art piece. The video works across multiple scales, each of which refuses fixity and division: the viewer of the art gallery footage finds herself affectively and interpretively implicated in the awkward interaction between strangers in the gallery; she then finds herself thinking with and against the cognitive neuroscientific attempts to interpret and "code" the expressions and gestures in the video; and these expressions and gestures of scientific interpretation are differently put into play by actors who repeatedly attempt to re-enact the analysis. At no point is anyone, including the spectator, positioned outside of the interpretive frame of thinking and making. What results is a powerfully layered and insistently iterative account of the "material and discursive conditions through which a phenomenon can be experienced, interrogated, or known" (Gluzman 2017, 115) that refuses to sit still, to move unidirectionally, or to step outside of the deeply embodied and multi-scalar process of coming-to-know. In this way, Gluzman puts her model of "Research as Theatre" (RaT) (forthcoming) into play, as she uses the heterogeneity and theatricality of research as a resource for performing thinking in its multiplicity, situatedness, and irreducibility, rather than treating it as "noise" to be contained or silenced within the experimental context.

In line with Gluzman's project, this special issue proceeds from the premise that the lab and the theatre, and science and performance more broadly, are not separate domains or disciplines, but are rather complexly commingled sites for generating a mimetic play of natural-cultural possibilities. Rather than reinforcing disciplinary divides between the social sciences, humanities, and natural sciences, or between science, performance, and theatre by making recourse to comparison and critique or by drawing on "traffic" metaphors, the articles and materials in this issue think these fields together-apart, to borrow Karen Barad's phrase (2014), as entangled, intra-related, but not commensurate sites and practices of making-knowing. As such, this issue is invested in undisciplining approaches to science and performance as we work to trouble the conjunctive "and" that both separates and conjoins.

Act (w). Scene ηφℒΞ. Diffractive Histories and Hauntological Relations (In Which Spectres Abound)

"Enter the ghost, exit the ghost, re-enter the ghost." (*Hamlet*, quoted in Derrida 1994, xix; quoted in Barad 2010, 245)

"A ghost that is the specter of multiplicity itself" (Barad 2010, 263), which haunts seemingly unified objects of knowledge and intervention (plays, quarks, particles, bodies) has often gone by the name of performance. In the fields of science and technology studies (STS) and performance studies (PS), performance and performativity have offered robust theoretical frameworks for examining how scientific and social acts of world-making emerge through a diverse set of material and semiotic practices that un/fold in and over time. By centring process and power, performance theory has opened up spaces to examine how knowledge practices and objects are materialized, enacted, and achieved in a shifting field of relations. As early as 1979, Bruno Latour and Steven Woolgar turned to the language of performance in their attempts to move beyond a metaphysics of truth in the sciences, and to show how scientific knowledge is not simply holding up a mirror to fixed and immutable "natures," but is instead a set of culturally and historically contingent practices of materializing natures *as* natures. At roughly the same time, theorists in performance studies (Turner

1982; Schechner 1985) and feminist theory (Butler 1990) re/turned to theories of performance from linguistics (Austin 1955) and sociology (Goffman 1959), and performances of theory in various art practices, to analyze anew the ongoing composition of social life and subjectivity through repetitive, embodied acts of doing (*as*) that appear to congeal over time into being (*as is*).

The cross-pollination between the fields of STS and PS in recent decades has been rich, particularly in feminist and postcolonial approaches to science and technology that explore the complex matrices of power and manifold formations of knowledge that are unevenly at play in studying and shaping our naturalcultural worlds.⁷ While many thinkers and makers have turned to the potentials of performance to think and do otherwise, articles in this issue make clear that there is nothing inherently radical about performance's place in the sciences. Historically, performance has played a central role in stabilizing dominant regimes of evidence and authority—from the laboratory as a “theatre of proof” (Latour 1993) to the theatre as a laboratory of the social. Indeed, a range of uneasy compromises, ongoing complicities, and unruly connections crop up at the conjunction of science and performance. What types of knowledge, expertise, and agency have these performances actively silenced, excluded, or foreclosed? Are the performing arts and experimental sciences non-innocent in regimes of power and knowledge, as likely to advance as to disrupt sociopolitical systems of inequality, exploitation, or extraction?

Stage Left:

[London, 1660, by way of Santa Cruz, 1997] The ghost of Robert Boyle stands before a crowd of witnesses at the Royal Society. In this “theatre of persuasion” (Haraway 1997, 25), Boyle stands beside a large contraption with a glass chamber at the top. Inside the chamber is a small bird. A ghostly technician who is hidden beneath the floor pumps the gears. A crowd of wealthy men and women look on. As the pumping slowly creates a vacuum, they can see air through its absence: the twitches, spasms, and gasps of the spectral animal as it begins to suffocate. Boyle looks on passively and states, “It is not I who say this [vacuum is real]; it is the machine” (Shapin and Schaffer 1985, 77). He is the model of science's new “modest witness”—“the legitimate and authorized ventriloquist for the object world, adding nothing from his mere opinions, from his biasing embodiment” (Haraway 1997, 24). The desired effect of his performance of transparency is the obfuscation of his own embodiment, situatedness, and subjectivity. But something runs amok; the unseemliness of theatricality tugs at the seams of Boyle's performance.

A few of the women in attendance are appalled. A womanly apparition steps up and says, “It is you who built this machine and it is you who are using this machine to kill this animal. And if *you* will not break the seal and let air back into the chamber, *I* will.”⁸ The other women join her in demanding that Boyle resuscitate the bird at once. The women's names are never listed among the witnesses who attested to the validity of the experiment. Their “biasing embodiment,” it seems, got in the way of disinterested and credible scientific looking because they insisted on seeing the theatrical seams of Boyle's production. In getting it wrong, in failing to properly see Boyle as invisible and themselves as passive onlookers, these unruly women disrupt the theatre of proof by treating it like the theatre. Unlike performativity, which is marked by a thrall toward ontological coherence (when a performative is felicitous, it effaces the conditions of its construction), theatre is defined through its ontological undecidability (the not-not or both/and) in which the artifice and scaffolding never recede from the scene of the so-called “real.”⁹ Through their attunement to this theatrical interstice between seeming and being, these spectating spectres see the possibility to enact an otherwise in which the bird doesn't die and the fact doesn't matter.

Boyle and a few of the other wealthy gentleman make arrangements to meet at night to avoid such interruptions again. After a hotly contested visit by Margaret Cavendish in 1667, the Royal Society excludes women from entrance until it is legally required to open its doors to women again in 1945. Spectres abound.

In *Modest Witness*, Donna Haraway returns to Robert Boyle's 1660 account of his air-pump demonstration to offer a "diffractive reading" of how the experimental performance of making a matter of fact was simultaneously a performative process of making race, class, and gender. Haraway reminds us that women were forcibly evacuated from the space, both epistemologically and literally. Working-class men, too, were excluded except when a select few were made to dis/appear as invisible lab technicians under the floor, working the air-pump's bellows (Shapin 1989; Haraway 1997). The theatrical stage also haunts science's theatre of persuasion. The ghost from *Hamlet* re-enters in 1660: apparitions and caricatures of women and colonized peoples were regularly played across the bodies of actors on early modern stages, while women were expressly prohibited from performing on public stages and racialized populations were infrequently cast at best. In this same time, through epistemic, economic, and militaristic imperialism, Britain was working to consolidate power and property with the resurgence of witch hunts and the ongoing process of violently colonizing the Americas, the Caribbean, and parts of the African continent (Federici 2004). In ensuing centuries, racialized and gendered populations resurface in the halls of the Society and on the stages of the theatre as research objects and cultural oddities. But spectres of other subaltern stories, subjectivities, and sciences also abound within and beyond these particular configurations of spacetime-mattering. How to let the ghosts speak?

"Diffraction patterns record the history of interaction, interference, reinforcement, difference" (Haraway 1997, 273). Diffraction is a methodology that attends to how exclusions matter.

Center Stage:

[London, 1613, and/in New York, 2014, by way of Vancouver, 2017] Jennifer Park's article in this issue moves between the early modern stage and the contemporary humanities laboratory in her "diffractive reading" of gender-in-the-making within the heterogeneous histories of performance in/as/and alchemy. Park charts the temporally promiscuous crossings of gendered metaphors, as they are materialized in scientific, literary, and theatrical practices of knowing and making glass vessels. She begins with John Webster's 1660 play *The Duchess of Malfi* in which a male character fantasizes that a female character's womb is made of glass, her reproductive insides rendered available to the theatrical and scientific gaze. Park then leaves the theatre to go next door to the glass-houses in which alchemical practices were staged for publics. In these spaces, alchemists created and used glass vessels as artificial wombs, acting out masculinist fantasies of mastering women's bodily natures and achieving male reproduction through the creation and control of glass wombs. Park powerfully demonstrates how gendered inequalities were made and remade through these different theatrical and scientific practices of staging and intervening in women's bodies, and illuminates the fraught ways these histories haunt contemporary scientific and humanistic modes of inquiry. In the scientific laboratory today, Park argues, the guise of neutrality works to efface and inadvertently replicate the gendered histories embedded in everyday glass instruments. In humanities laboratories at Columbia University where historians reenact early modern alchemical experiments, they, too, risk reproducing the charged performance histories of scientific protocols and materials if they don't attend to the spectres of gender they body forth. Through her compelling cartography of the metaphorical and material lives of glass vessels, Park makes visible the dissonances, resonances, and tangles of different disciplinary and disciplining practices, and illustrates how they mimic and

mutate the broader field of power relations in which they are historically enmeshed. As Susan Leigh Star reminds us, “power is about *whose* metaphor brings worlds together, and holds them there” (1991, 52).

In Jane Long’s video “Subjective Object,” a latex-gloved hand provocatively rubs a glass petri dish as white text runs under the screen, asking “can I get a witness?” Seconds later, witness mutates into whiteness: 1930s-era big band music plays as Long stands before a white wall in a white labcoat; she slowly sterilizes her face with a sponge, pulls back her hair, and then begins to apply white face paint with her latex gloves. In this slice of time, Long stunningly and playfully remaps zones of in/visibility and in/authenticity in the raced and gendered performance cultures of science. She paints on the positionality of white masculinity that haunts science’s objectivity in the enduring figure of the “modest witness” (Shapin and Shaffer 1985; Haraway 1997) and the framework of science as a “culture of no culture” (Traweek 1988, 162). This is a culture, Long confides at the beginning of the video, that she used to love and a language that used to be her own. But now, she tells us, she is working to “put all of the personality and culture back into the gridlines.”

As she plays the whiteness of the modest witness across her body against the backdrop of the laboratory and the soundtrack of the stage, Long also surfaces present histories of racial caricatures in blackface minstrelsy, natural history, and colonial science that continue to consolidate the epistemic authority and racial authenticity of white masculinity through inauthentic postures. After whitening up, Long gazes into the camera, her face slack, “neutral,” the model of the modest witness. She then contorts her face into a series of expressions that are reminiscent of the silent screams in Butoh dance. As Long claws at her whitened face and rolls her eyes back in her head in an act of immodest witness, and then morphs back into the modest witness, gloved, goggled, protected from contamination, the ghost of Niels Bohr momentarily returns to the scene: war time, science time, inherited time, experimental time, a time to be born, and a time to die converge in the brief glimpse of the ghastly, ghostly dance of atomic horror realized in Hiroshima and Nagasaki. “Do you wanna hear a joke?” Long asks. “Do you know why you can’t trust an atom? Because they make up everything.”

Long’s video together with her lab notebook entitled “Everything and Nothing” model an alternate mode of witness; she performs what Rebecca Schneider has recently termed “wit(h)ness” (Schneider 2017). Long bears witness to science and performance’s “imperialist white-supremacist capitalist patriarchal” habits of knowing (hooks 2004, 17). But she also, at the same time, performs *wit(h)ness* as she attends carefully and bodily to the constitutive exclusions that matter, that persist, that unsettle, that take flight. According to Barad, concepts are momentary acts of differentiating, of making cuts within an inseparable field of matter and meaning, observer and observed. As such, a concept—objectivity, time, race, atom—is always haunted and de/composed by all that is excluded in its very being/becoming-determinate. Writes Long in her lab notebook,

If we only focus on a part of the SINE wave, it can appear to be a linear plot. If we only focus on the black boy’s organs that weren’t hit by the bullet in the pathology report, then the black body appears healthy and fine . . . That’s the problem, isn’t it? (W)hole. I saw this on Andre’s wall once. He made a typo. But that’s what it is.

Long resituates the scene of research within this “(w)hole of history” (I riff here on Suzan-Lori Parks’ phrase from *The America Play*). Long “dig[s] for bones, hear[s] the bones sing, write[s] it down” (Parks 1995, 4); she incorporates these stories and songs in her lab notebook and repopulates

the laboratory with her own body and the many other non/human bodies, knowledges, and times that make up science's hauntological relations. This (w)hole, Schneider reminds us via Parks along with black and indigenous feminist thinkers like Patricia Hill Collins and Leanne Simpson, is the "both/and" of performance, history, repetition, knowing, being, un/becoming—both here-now and there-then, both violence and freedom, both no one and know one, both inside and outside. Though this practice of *immodest wit(h)nessing*, Long takes these ghosts seriously; she lets them speak: "The inside only made from the outside closing in."

In their contribution to this issue, social scientist Sarah Klein and cognitive scientist Tyler Margetis bring what I am calling "immodest wit(h)ness" into the cognitive psychology lab as a research methodology. Klein and Marghetis ask, how do we "take scientific performativity seriously and literally" in our research practice? How do we acknowledge and approach the multiply entangled relations of researcher and researched, and how do we attend to the iterativity and contingency of research as a situated, embodied practice that is at the same time a technique of power? Is there a way to take up these performatic in/determinacies as an epistemic and experimental tool, rather than as a threat to be managed and expunged (Gluzman forthcoming)? Klein and Marghetis respond to these questions by designing a flexible and reflexive research apparatus, which they call "experiment performance" (EXPF). EXPF draws together protocols from ethnomethodology (Harold Garfinkel) and performance art (Adrian Piper) as a way of doing scientific research and social theory differently. As they show through a detailed account of EXPF, the improvisational and "response-able" structure of EXPF allowed them to continually "become-with" (Haraway 2007) themselves, each other, the research subjects, the cognitive objects, and the broader infrastructures and norms that enable and constrain their scientific practice. This project beautifully reconfigures experimental relations in the sciences and the social sciences, as it powerfully models "response-ability" by cultivating the "radical ability to remember and feel what is going on" and "work[ing] to respond practically" (78) from *within* a shifting field of knowledges, histories, and relations. The implications of EXPF are far-reaching, as Klein and Marghetis put into play a social/scientific practice that is willing and able to work with the ghosts that go by the names of implicit assumptions, epistemic erasures, power dynamics, colonial histories, and performative contingencies (Subramaniam 2014). In short, they show us that it is possible and necessary to hold on to the (w)hole.

To address the past (and the 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 to indeterminacy in moving towards what is to-come. (Barad 2010: 264)

Can I get a witness?

Vahri McKenzie probes the limits of reflexive and participatory models of wi(t)hness in science and performance in the context of big data and digital surveillance. If Boyle's theatre of persuasion constituted differentiated "publics" through performances of technological transparency and modest witness, how do contemporary formations of surveillance in theatre and science flip the script, converting private acts of looking into public forms of information through the *appearance* of technological transparency? This is the question McKenzie asks in *Only the Envelope*, a work of live art that invited subject-participants to watch a video while wearing a wireless eye-tracking device and

being monitored by “scientists” (actors) who stood alongside them in the viewing space. McKenzie hoped to render the pervasive and often opaque technologies of surveillance visible and contestable for participants. Wit(h)ness, here, was an invitation to bear witness to the ways in which surveillance is always with us, and to draw out the unequal entanglements of freedom and control, informant and informed, knower and known in the context of digital governance. Yet, to McKenzie’s surprise, institutional ethical protocols around consent in the live science-performance setting scripted more conventional active-passive research roles, and participants modelled compliance rather than critique. This performance made visible the ways in which informed consent in performance/science, much like in online platforms wherein “consent” is often necessary for access and use, works to conceal through a gesture of transparency and to disempower through a script of participation.

Act sf. Scene SF. Inheriting the Future: Technoscientific Histories-to-Come

SpaceTime Coordinates: indeterminate, untimely.

Center Stage:

[Champaign, 2016] A figure in a tight white face-covering full body suit stands still on a small platform. The figure’s back is connected to a large piece of white drywall by several cables. As the figure slowly begins to move, its cybernetic skin is rendered taut and it emits a low electronic hum as it gently pulls and breathes against the cables. The figure begins to remove its white skin, but there are only more layers of the same whiteness beneath, each still tethered to the wall. Slowly, sensuously, the faceless body pulls against the cables and tears jagged lines through the wall. Bright white light shines through these tears. As the body moves more deliberately against the wall, more “light/lifelines” bleed brightly through the cuts and dissonant, pulsing electronic sounds fill the space. The sounds grow louder, more frenzied as the figure breaks apart the wall, revealing more light as each chunk is ripped away. The figure is self-described Miami-born, mixed Latinx queer artist Erica Gressman performing *Wall of Skin* at a symposium on the theme “Being Brown, Being Down: Performances of Spic and Span.” Just outside of the building that houses this *Wall of Skin*, someone has scrawled “build the wall” and “deport them.” Donald Trump’s presidential campaign to “Make America Great Again” is underway. He is not the president. This is where Sandra Ruiz’s article “Organismal Futurisms in Brown Sound and Queer Luminosity” ends, as it offers up other histories of the future. In this piece, Ruiz turns and re-turns us to Gressman’s Brown, queer cyborgian performance as an invitation and an imperative to “inhale and exhale against the tempo of the world’s dominant sound and light system” (2017, 80).

En unas pocas centurias, the future will belong to the *mestiza*. Because the future depends on the breaking down of paradigms, it depends on the straddling of two or more cultures. By creating a new mythos – that is, a change in the way we perceive reality, the way we see ourselves, and the ways we behave – *la mestiza* creates a new consciousness (Anzaldúa 1999: 102).

Gressman’s sonic skin is made from inexpensive technology—a simple circuit connected to light-sensitive photocells. The circuit’s voltage oscillates between two states, producing clicking sounds. As more light hits the photocells attached to Gressman’s bodysuit, the oscillation increases in frequency, blurring into seamless, yet unsettling electronic tones. Within the white male-dominated DIY electronic music world, these types of light-sensitive circuits are typically contained within an

enclosure like a black box and controlled manually—blocking or allowing light to influence the circuit and make sound. Gressman disrupts this control-based paradigm’s separation between body and technology, observer and observed, actor and object by shifting the sites of sonification to the material intra-actions unfolding at the intersections of her body, the technology, and the architecture of the room.¹⁰ The space of the performance itself becomes the black box, its inner workings open and exposed, yet also contained, containing all of the non/human actors inside its walls—the inside only made from the outside closing in.

Ruiz illuminates how Gressman hacks experimental genres of punk, performance art, sound art, and electronic music in *Wall of Skin*, while at the same time unsettling the genres of experimental life that emerge from the sciences of “Man.” By remixing these epistemic and aesthetic genres in her “science of oppositional ideology” (Sandoval 1991, 2), Gressman’s performance of Brown futurism materializes a space for thinking and being “human after [and before] Man” (Wynter 2003), one that turns to multiplicity over singularity, entanglement over autonomy, movement over fixity, knowing *with* over knowing *that*. Circuiting Gressman’s more-than-human cyborg through Chela Sandoval’s decolonial feminist theory of oppositional consciousness, Ruiz powerfully illustrates how “colonized peoples have already developed the cyborg skills required for survival under techno-human conditions” (1991, 375). For Ruiz, Gressman’s cyborgian performance offers up Brown sounds and queer luminosity as unsettling bodily technologies of fugitivity and capture, which refuse to resolve into dominant structures of language, vision, and mattering. As Ruiz explains, Gressman’s singing cybernetic skin “is the site that frees her from the limiting constraints of the human, but that also binds her to her own skin and laboured breath” (2017, 80), and it is one that extends multiply into the space of the room, as she transmutes racializing technologies—skins, walls, sights, circuits, breaths—into a shared sonic environment that privileges noise over signal.

In their video “when they are anonymous they are free,” &/[also turns to textural electronic soundscapes to think beside and beyond dominant social and technoscientific frameworks of mattering. Shimmery electronic sounds play as glitchy speckles of white crackle against a black screen. The flickering white specks eventually resolve into white text, which moves quickly in two densely layered rows against the black. While language enters the frame, it is in constant movement, refusing fixity as the eye struggles to capture words, phrases, moments of meaning in flux. In order to “interpret” the video according to available grammars of intelligibility, the viewer must press pause again and again. The viewer’s value systems and epistemic frames are rendered visible with each button push: culturally-inflected expectations of stability, legibility, and coherence converge to script stilling the frame so as to facilitate reading and “knowing.” Like the laboratory rat in the “Skinner box” who is rewarded with food or cocaine with each button push, a rush of pleasure emerges from what is momentarily apprehended.¹¹ And yet, for the rat and viewer alike this moment of capture is fraught. In the video, each frame of fragmented visual-grammatical meaning captured in the “paused” text is only made available through stopping the play of lights and silencing the play of sounds. Each still is only a fragment, a hole in an infinitely larger and smaller whole that is dis/continuously unfolding—“more noise . . . they are,” “am i full of love . . . when they are,” “to cyborgs of color . . . anonymous,” “muscle is meat is technology . . . i am.” If “knowledge is made for cutting” (Foucault 1984, 88), &/[_ prompts the viewer to ask, what is lost with each “cut” into a continuously shifting and heterogeneous field of spacetime mattering? How do these exclusions matter? How do these cuts land on bodies, mark them, bind them?

The text in &/[_’s video does eventually slow down, as the question “bind your body?” lingers on the screen, white lines framing it from above and below. The query comes into and out of focus as a

solid white line cuts across it and recedes, again and again, and the sound becomes deeper, harsher. The patterns of thick white-on-black lines on the screen are chest binders are binaries are equal signs are cuts are prison bars are categories are inside are outside are walls are skins are white are black are together are apart are closed are open. To bind is to hold, to contain, to fix in place; it is also to cohere, combine, form an attachment; and it is a predicament—to be caught in a tight spot. “Entanglements are relations of obligation—being bound to the other” (Barad 2010, 265).

Both Ruiz and &/_[enact reconfigurations of spacetime-matterings—partial and capacious models for knowing and being together-apart without closure in a future-past dense with im/possibilities. They show us how the practice of SF—“science fiction, speculative fabulation, string figures, speculative feminism, science fact, so far” (Haraway 2016, 3)—is always already a part of our world-making practices. By working from within these temporal and epistemological tangles, they illustrate the possibility and necessity of re-making matter and meaning, listening to the ghosts, and remembering what might yet have been. In their practices and processes of SF, they don’t offer a way out of the trouble. They don’t give us a resolution. They don’t promise repair. They insist that “the past is never closed, never finished once and for all,” but this also means that “there is no taking it back, setting time aright, putting the world back on its axis” (Barad 2010, 264). “There is no erasure finally,” writes Barad (264). And this is both the promise and the peril of our entanglements.

“Mattering is still a question,” writes &/_[(2017, 119).

Stage Left:

“Only by facing the ghosts, in their materiality, and acknowledging injustice without the empty promise of complete repair (of making amends finally) can we come close to taking them at their word.” (Barad 2010, 264)

[London, 1660 by way of the future] Let us return once more to the spectral scene of matter-in-the-making at the Royal Society. The ghost of Robert Boyle is onstage. The bird is in the glass orb, suspended, like Schrödinger’s cat, in an in/determinate state between life and death. Some ghosts are in the audience. Others are beneath the stage. Most of the ghosts are outside. Which ghosts do we let speak here-now-there-then? Which “corpses” might speak anyway, out of turn or in error, by an accidental slip of the tongue or trip of the foot, or as fearful screeches and a flurried beating of wings (Ridout 2006)? What possibilities emerge for knowing and being *otherwise* in these contingencies, excesses, slippages that expose and disrupt the material and discursive frameworks of making facts matter? This is the question of mattering that theatre re/plays for us anew in each iteration.

My hope is that the disparate works that hold together in this journal issue offer up ways of doing science *as* theatre, inviting us to engage in practices of immodest wit(h)ness, to let the ghosts speak, to face them in their materiality and heterogeneity, and to attend carefully, insistently to the question of mattering that de/composes the matter of fact. Because the fact isn’t the only matter. “Dark matter, still matter, don’t matter, or hardly matter’s all something that matters” (Long 2017).

How do we want Boyle’s science play to end again, for the first time?

Notes

1. This introduction playfully mimics the structure of Karen Barad’s article “Quantum Entanglements and Hauntological Relations of Inheritance.” Like Barad’s piece that structurally seeks to disrupt conventional narratives of linear history, scientific progress, and spatial unity through a disjointed writing style, this piece, too, invites the reader to “jump from any scene to another . . . and still have a sense of connectivity through the traces of variously entangled threads” (2010, 245).

2. For more on theatre’s fitful temporalities and tangles of “liveness,” see Rebecca Schneider’s book *Performing Remains* (2011). Here, I also draw upon Richard Schechner’s fundamental theorization of the not-not, or both/and in theatre, as he explains that the actor on stage is not Hamlet, but is not-not Hamlet (1985, 110). Finally, the place of surrogation and/as performance has been richly theorized by Joseph Roach in *Cities of the Dead* (1996).

3. In her essay “Possession,” playwright Suzan-Lori Parks describes how she uses “the theatre like an incubator to create ‘new’ historical events”:

Since history is a recorded or remembered event, theatre, for me, is the perfect place to “make” history—that is, because so much of African-American history has been unrecorded, dismembered, washed out, one of my tasks as a playwright is to . . . locate the ancestral burial ground, dig for bones, hear the bones sing, write it down. The bones tell us what was, is, will be; and because their song is the play—something that through a production *actually happens*—I’m working theatre like an incubator to create “new” historical events (1995, 4–5).

4. *Oxford English Dictionary Online*, “fact.”

5. Latour also applied this theatre of proof model to his own social scientific and historical research in the 1999 exhibition *Laboratorium* curated by Hans Ulrich Obrist and Barbara Vanderlinden. In this piece, Latour organized a public series of demonstrations in which he re-enacted famous historical experiments as a way to think about the conditions under which experimental objects are materialized in and beyond the laboratory (Latour 2001).

6. In *Science in Action* (1987), Bruno Latour uses the term “black box” to describe an object, concept, system, or technology whose internal workings and historical contingencies are rendered opaque while at the same time self-evident. Mirror neurons, as they are often taken up in theatre studies, would be one example of a black box.

7. For excellent examples of this interdisciplinary work, see the two special issues of *Catalyst* guest edited by Banu Subramaniam and Angela Willey on the theme of “Science out of Feminist Theory” (2017a and 2017b), as well as the special issue of *differences* guest edited by Sophia Roosth and Astrid Schrader on the theme of “Feminist Theory out of Science” (2012).

8. I am fictionalizing the details of an actual encounter that Boyle recounted in his *New Experiments Physico-Mechanical Touching the Spring of Air* (1660). I come to this scene by way of Elizabeth Potter’s *Gender and Boyle’s Gas Laws* (2001), which was cited in Donna Haraway’s *Modest Witness* (1997). These two books provide the historical and theoretical basis for this passage.

9. In her forthcoming chapter “Research as Theatre (RaT),” Yelena Gluzman explores the research potentialities that inhere in theatricality’s overt intentionality and artifice. She argues that it is precisely in its infelicity and its “outness” about the material and discursive contingencies of its production that theatricality opens up spaces to carefully attend to making and doing in our research. In my own research on contemporary technoscientific cultures of speculation and risk (Nye 2012), I look to the ways theatricality is also non-innocent in regimes of power. From cloning and patenting genes to selling genetic futures, processes of “making up” biological matter and meaning have moved centre stage in biocapitalist regimes of knowledge and intervention. My work explores how a genetic science that is increasingly “out” about its theatricality has opened spaces for constructing and contesting the political, economic, and social dimensions of

technoscience and more broadly, of “life itself.” At the same time, I attend to the ways in which speculative practices newly obscure, exploit, or imagine social inequalities.

10. I am indebted to Peter Bussigel for his insights into the technological intricacies and performance histories of light-sensitive audio synthesizers.

11. I am grateful to Yelena Gluzman for her comments on an early draft in which she pointed out the similarity between a viewer pressing pause in the video and a rat pressing a lever in the lab.

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