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Nuclear Ghosts

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Edited by
Jenny Stümer

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Edited by Jenny Stümer

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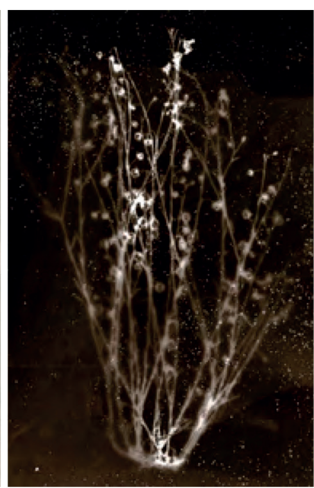
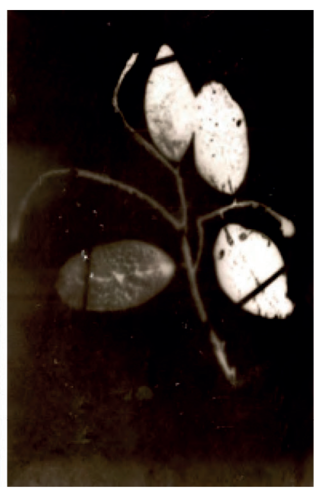

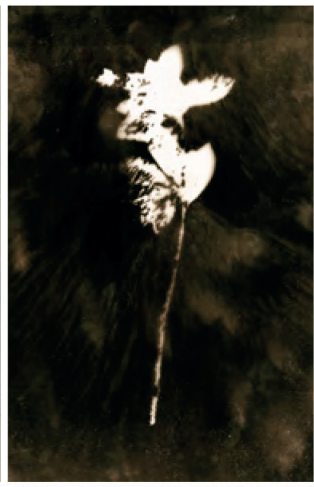

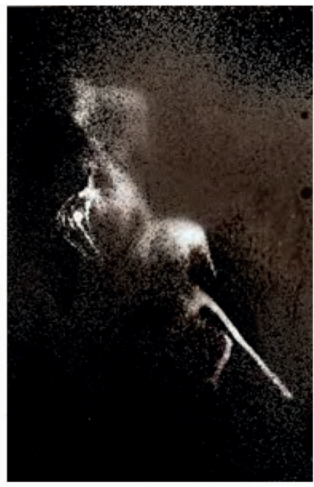
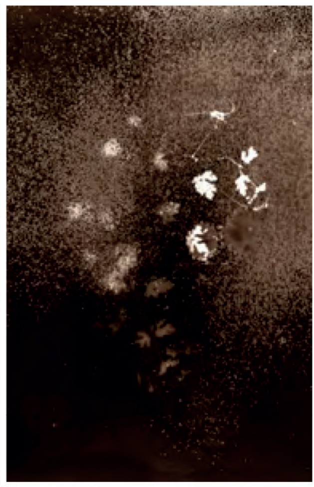
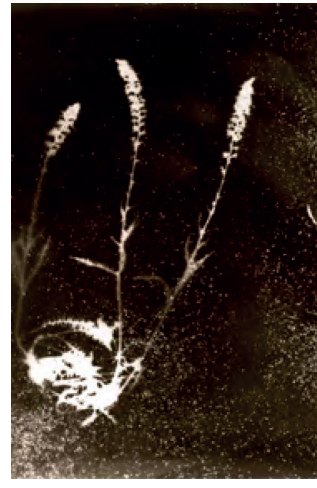
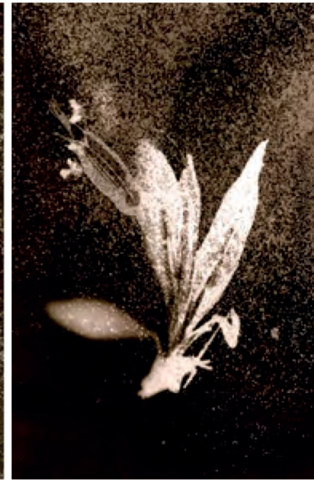
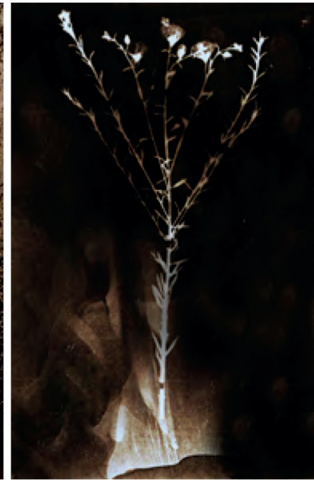

Notes on the Cover Image

LINUM STRICTUM, EXCLUSION ZONE, CHERNOBYL, RADIATION LEVEL: 1.7 SV/H ,
ANAÏS TONDEUR, CHERNOBYL HERBARIUM, 2011 – ONGOING

Some images in Anaïs Tondeur's "Chernobyl Herbarium" are the explosions of light. Others are softly glowing, breathing with fragility and precariousness. The explosive imprints are, in effect, reminiscent of volcanic eruptions at night, hot lava spewing from the depths of the earth. Even assuming it is not the actual trace of radiation (which the specimens in the herbarium have received from the isotopes of cesium-137 and strontium-90 mixed with the soil of the exclusion zone) that comes through and shines forth from the plants' contact with photosensitive paper, the resulting works of art cannot help but send us back to a space and time outside the frame, wherein this Linum Usitatissimum germinated, grew, and blossomed.

The images are the visible traces of an invisible calamity, guided across the threshold of sight by the power of art. The literal translation of the technique used here, photogram, is a "line of light." Not a photograph, "the writing of light," but a photogram, its line captured on phot sensi- tive paper, upon which the object is placed. In writing, a line is already too idealized, too heavy with meaning, overburdened with sense. In a photograph, light's imprint is further removed from the being that emitted or reflected it than in a photogram, where, absent the camera, the line is allowed to be itself, to trace itself outside the system of coded significations and machinic mediations. To impose itself from up-close. Touching… It endures, etched, engraved, engrained—the energy it trans- ported both reflected (or refracted) and absorbed. Much like radiation, indifferently imbibed by whatever and whoever is on its path (the soil, buildings, plants, animals, humans) yet uncontainable in any single entity whose timeframe it invariably overflows. Through her aesthetic practice, Tondeur facilitates the explosions of light trapped in plants, its lines dispersed, crisscrossing photograms every which way. She liberates the traces etched into them without violence, avoiding the repetition of the first, invisible event of Chernobyl and, at the same time, capturing some- thing of it. Release and preservation; preservation and release: by the grace of art.

Excerpt from Michael Marder and Anaïs Tondeur. 2016. *The Chernobyl Herbarium: Fragments of an Exploded Consciousness*, London: Open Humanities Press.

Editorial
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Jenny Stümer

Introduction: Nuclear Ghosts, A Special Issue

Apocalypse can take time, even a lot of time, it is not necessarily an instantaneous event, but can last and last...long enough for another world and history to take place before 'it all ends'.
Alenka Zupančič

The derealization of the 'Other' means that it is neither alive nor dead, but interminably spectral.
Judith Butler

Who gave them this power?
Who anointed them with the power to burn?
Kathy Jetñil-Kijiner

When the Russian War on Ukraine began to consume media outlets around the world in the early stages of the invasion in February 2022, many of the discussions quickly turned to the prospect of nuclear catastrophe. Since then the Russian president Vladimir Putin has repeatedly highlighted Russia's nuclear capacities and willingness to deploy such force, strategically stationing tactical nuclear weapons in Belarus or deploying the heavy symbolism of occupying the Chornobyl reactor for weeks on end. Routinely, news coverage would link these threats to a discourse of end-world scenarios, headlining the unfolding adversities as impending "nuclear apocalypse," (Jackson 2023) "Putin's apocalypse," (Neef 2022) or, yet more forthcoming, "apocalypse now" (Meadors 2023; Owen 2023). In January 2023, the Bulletin of the Atomic Scientists moved the hands of the Dooms Day clock—a device introduced in 1947 to represent the scientists' estimation of possible global catastrophe—forward to 90 seconds to midnight, implying an unprecedented proximity to apoca-

lyptic destruction. The "apocalyptic tone," so aptly invoked by Jacques Derrida in 1984, it seems, has firmly attached itself to a discussion about contemporary nuclear threat, most notably in the US and Western Europe.

What is remarkable about these developments is not so much a resurgence of nuclear danger or the dooms-day framing of news headlines, but how the assumptions that underwrite this ostensibly fresh embrace of radioactive apocalypse signal a temporal, emotional, and geographical fissure in the perception of nuclearity. On the one hand, the fear of nuclear catastrophe is saturated with future anticipation or the frequent invocation of a looming 'end of the world'. On the other hand, nuclear threat and violence are commonly treated as Cold War relics, 'newly' emerging in the chaos of the present but nevertheless always already relegated to the past. In both cases the unending present of nuclear violence is carefully ignored—predominantly in terms of the ongoing repercussions and enduring perpetuations of nuclear testing as well as the ever-emerging entanglements, in Karen Barad's sense, between nuclear violence and the assaults of colonialism, racial capitalism, militarism, sexism, climate injustice and so on, particularly in those places that do not tend to monopolize the news: the Marshall Islands, French Polynesia, the lands of Australian Aborigines, Newe Sogobia, Hawaii, and many more. Eclipsing those fears, desires, affects, and fantasies that capture what Gabriele Schwab calls the "ontological, psychological, and epistemological break inaugurated by the atomic age" (2020, xiii), this voided present/presence (or a present/presence that is avoided) suggests a turn to apocalypse that points to a range of possible catastrophic 'endings' and is simultaneously evading, if not disarming, the possibility of far-reaching change or insight, precisely because, from the perspective of well-worn privileges, many people still get to believe that despite the presence of the atomic bomb, the world has in fact not ended (yet).

To a degree, denial of this kind is necessary in order to cope with and maintain a world that has been rendered fragile beyond repair with the very initiation of the nuclear war machine. "Who can bear to lose the world," asks Lauren Berlant (2011, 27) and "what happens when the loss of what's not working is more unbearable than the having of it and vice versa?" Paradoxically nuclear destruction has emerged as a way of apocalyptic world-making, by which the foundational violence of imperial political power—division, hierarchization, and objectification—is intensified, escalated, and unevenly distributed. Indigenous communities and their lands face the highest level of vulnerability to ongoing nuclear testing. More than 900 nuclear tests have been conducted on Shoshone territory in the US alone. At the same time, the nine nuclear military powers—the

United States, Russia, the United Kingdom, France, China, India, Pakistan, the Democratic People's Republic of Korea (North Korea) and Israel—continue to expand and develop their nuclear arsenals. In January 2023, the Stockholm International Peace Research Institute (SIPRI) estimated a total global inventory of 12512 nuclear warheads, around 2000 of which, nearly all of them controlled by the US and Russia, are kept in a state of "high operational alert." At the same time, many people "go on living as if the nuclear danger were not there" (Schwab 2020, 5), clinging on to a helpless and in many ways 'cruel' optimism, putting faith into technological futurism or ignoring the many ends of the world that have happened and continue to happen altogether. If this sense of 'holding on regardless' is a privilege, who or what is being evacuated by this refusal to confront the ends of worlds? Who or what is vanished in the dodging? And, at the same time, how might we make sense of the absurd accumulation and expansion of a nuclear weapons arsenal that has rendered everyone on the planet a target, an object, a ghost?

This special issue of *Apocalyptica* takes on the friction between nuclear imaginaries and nuclear politics, proposing a different kind of conversation while also gearing towards something amiss in familiar fantasies about the end of the world or ends of worlds in the context of nuclear threat. Bringing together exceptional scholars, artists, and journalists engaged in the work of nuclear criticism, the issue challenges what Lisa Yoneyama has called "nuclear universalism" (1999, 15), which both obscures the ongoing violence of the nuclear industrial complex and simultaneously enables its flourishing. It is also an opportunity to confront the systematic silencing of (anti) nuclear debates and practices of survivance, theorizing the unfinished business of nuclear disaster and positing a meaningful politics of re-membering which, in Barad's sense, "is not about going back to what was but rather about…the attempt to do justice, to account for the devastation wrought as well as to produce openings [and] new possible histories," (2018, 63) thereby marking both an act of returning to and piecing together the world. Looking at the nuclear in its various political and intimate intersections with other ongoing structures of violence and oppression, this special issue is interested in a kind of undoing of the erasure wrought by hegemonic narratives about nuclear exceptionalism, historical repression, and apocalyptic futures in an effort to achieve a conversation about nuclear threat by which "the present begins to imagine itself otherwise," in Jessica Hurley's words (2020, 30), attending to the various entwinements between nuclear violence and the metaphysics of militarism, racism, colonialism, and intimate experience as a way to rethink scales of apocalypse and to reconsider the cultural, material, and ethical

implications of radioactivity as everyday familiarity, as structure of feeling, and as political injustice.

Ghosts have a presence of their own.

Tellingly, Barad (2018, 78) approaches the void through the lens of Derrida's hauntology as "a spectral realm" where "not even nothing can be free of ghosts." The political work of avoidance is hence always also a matter or mattering of the ghost or the ghostly; a 'ghostly matter' as Avery Gordon (1997) would say. To Gordon (2013, 107) "haunting describes how that which appears to be not there is often a seething presence, acting on and often meddling with taken-for-granted realities." Being haunted, in this sense, draws us into a temporal, emotional, and spatial rift (the kind I mentioned above) effecting a critical rejoinder to the presence/present that has been a/voided. Specifically it lends itself to contemplating the endurance of nuclear violence as something that is not actually located in 'the future' of all out nuclear war or banished to the past of World War II history and the succeeding years of the Cold War arms race but has been waging in the form of nuclear testing since the very first blast (see Kato 1993, Hashimoto 2003, Barad 2018).

The ghost begins by coming back.

The first atomic detonation was conducted on 16 July 1945 in the Jornada del Muerto desert, near Alamogordo in New Mexico — in an area which was home to several Native American villages, including two Apache tribes and chapters of the Navajo Nation. Initiating the nuclear age, the Trinity Test under the auspices of the Manhattan Project introduced the world to what Robert Oppenheimer, now often referred to as 'the father of the atomic bomb', described at the time as "the radiance of a thousand suns," a remark to which he later added the now infamous line "[n]ow I am become death, the destroyer of worlds" after the bombing of Hiroshima and Nagasaki a few weeks later in August 1945. Arguably, this apocalyptic tenor, which Derrida (1984b) would later link to a terrifying unconscious desire for all out annihilation that drives the militarization of the world, actually described a world-ending moment (and not necessarily a *potentially* world-ending moment) precisely because it revealed a different structure of existence, an ontological disorientation, or a new world — or so the fantasy goes — yet at the same time instantaneously repeated, escalated, and dragged into the present the long-standing history of settler colonial violence, the erasure of indigenous presences/presents, and

the unending ghosting of what Rob Nixon (2011, 150) has referred to as "unimagined communities."

Rather than producing existential change, it turns out, the 'end' staged in the New Mexican desert has largely served as a form of ideological consolidation, routinely insisting on the bomb as a tacit cataclysmic event that somehow always remains virtual so as to pave a way into futurity despite its capacity for all-out annihilation. From the outset there were bizarre claims that the bomb would ensure peace and save lives, even the world, providing a 'master signifier' for the nuclear imaginary, which to this day largely relies on the sublime tactic of comforting horror with megalomanic awe. In this way, the world-destroying menace of nuclear power was re-read as a world-building prospect, or as Derrida put it in his seminal essay "No Apocalypse, Not Now," the anticipation of complete destruction "installs humanity—and through all sorts of relays even defines the essence of modern humanity—in its rhetorical condition" (1984b, 24). However, procuring a philosophical suspicion that the nuclear age is that which brings the world into being, precisely through the possibility of ending it all, this sense of world-making actually puts into crisis the fantasy of a metaphysical objectivity of the 'world' and its possible endings. In denying the humanity and presence of those living through the repercussions of the blast, the bomb (also) displaces the end of the world by always already (a)voiding 'the end' of specific worlds and firmly locating the catastrophe in some ominous disastrous future fallout on the basis of which national and global aspirations can be accelerated and realized while continuing a colonial structure of violence. Ostensibly avoiding and hence 'ghosting' history, this dialectic of world-breaking and world-making produces a synthetic orientation towards the future but more pressingly renders the past undead.

What kind of worlds and endings become imaginable through the lens of the nuclear?

The fantasy of a cataclysmic future event/end misreads the apocalyptic extent of the nuclear project from the outset. Calling the apocalypse disappointing, because it can never actually live up to its anticipation, Alenka Zupančič (2017) explains that the fantasmatic motion of locating the end of the world simply in either the past or the future is precisely undone by the material initiation of the bomb. Drawing our attention instead to duration, Zupančič (2017, 24) explains "that we are not facing an approaching apocalypse, but are already standing within it." To her it is clear that "the

wrong button has already been pressed" and that "apocalypse has already started and is becoming an active part of our life and our world, such as it is" (2017, 24). Similarly, Oxana Timofeeva (2014) explains that "as far as it unveils (i. e., unveils what is), etymologically the apocalypse is always now," it discloses a certain reality. To her "it will not get worse; it's already worse" (2014) precisely because the apocalypse, in Zupančič's sense, is "not waiting for us somewhere in the future, but is dictating our social, economic, environmental conditions as we speak" (2017, 24). The explosion of the Trinity Test alongside the bombing of Hiroshima and Nagasaki in 1945, in other words, describes an apocalyptic moment of extreme loss (of the world/s), creating an ostensibly postapocalyptic, ghostly existence, as Katherine Guinness explains in this issue, or an end of time, "a vanishing presence…coming from the future as well as from the past" (Barad 2010, 257) .

The nuclear post-apocalypse, in other words, must be grasped as a form of accumulative, slow violence and enduring coloniality that divides, occupies, and ultimately structures entire worlds, specific communities, and ordinary subjectivities. To Joseph Masco (2021) the nuclear age is thus still emerging; it remains "highly contested," (11) repeating the fantasy of an "extremely short, fast and totalizing end of everything" (40) as the motor of establishing the very constitution or mattering (in the material and metaphoric sense) of the world. As such it achieves a nuclear infrastructure that affords the naturalization of atomic weapons and throws contemporary life into a form of ongoing crisis. In this sense, the nuclear age is more acutely described as sustaining (and being sustained by) what Jessica Hurley (2020, 9) calls "the nuclear mundane," which turns our attention away from the sublime event of fantasized omnipotence to "the environmental, infrastructural, bodily and social impacts of nuclear technologies and the politics that prioritize them." Consumed with a complex array of violent structures — colonial dispossession, antiblackness, xenophobia, and overlapping means of resource extraction — these "infrastructures of apocalypse" (Hurley 2020) intersect the ordinary, the intimate, and the psycho-political of everyday experiences with the forces of traumatic histories as they are conjured up and habitually repeated by unending nuclear injuries, suggesting that dying of radiation is always already caught up in power formations and always already taking place: gradually, slowly, ghosted.

What this issue highlights, then, is the way nuclear violence normalizes the post-apocalypse into a "crisis ordinary" (Berlant 2011, 9) which is both instantaneous and measured, tracking modes of death and survival from different vectors of privilege. In this scenario, apocalypse traces the

formation of specific lives and subjectivities (Schwab 2020) and it crucially points to a present that is a modality of intersecting forces and histories which circulate and form the ordinary as a zone of toxic convergences. Similar to the way in which Berlant conceptualizes crisis as unexceptional to history and consciousness — as a "process embedded in the ordinary that unfolds in stories about navigating what's overwhelming" — apocalypse, if viewed through the nuclear, then points to a world that might, as Danowski and Viveiros de Castro propose in their book *The Ends of the World*, "also fade away little by little" (2016, 25). It is this kind of apocalypse that demands a shot at uncovering that which has been made obstruse because it makes tenable the prospect of total and irrevocable destruction, not as a threat in the future but as a constitutive element in the making of the present, or what Barad (2018, 73) calls "the very worlding of the world."

Ghosts repeat. Ghosts incite.

The present/presence of ghosts is that by which the repressive work of the nuclear project ceases to be effective. Ghosts force a confrontation or a point of meeting that enables the apparition of abusive structures of violence which otherwise draw their force and invincibility precisely from being misread as over and done with. Ghosts, by contrast, mediate a specific way of seeing that which is spectral (and not necessarily spectacular) in its very application of power and injury. Through the eyes of the ghost, the nuclear project, in other words, is cautiously exposed in the full weight of its apocalyptic endurance. If nuclear ghosts point to those continuous endings that are slow moving and long in the making, too vast and simultaneously too close to comprehend through the exceptional, and instead trace a silent devastation and ongoingness of the everyday, then such ghosts rupture and limit the nuclear imaginary, precisely by asserting the patient violence of nuclear damage and grief. Hovering at the intersection between the political and the psychological, between the ecological and the technological, the empirical and the intuitive, the present and the absent, then and now, such ghosts relentlessly insist on their presence/present, or state of existence in the thick of the now, despite an ostensibly apocalyptic future and because of the world-ending past.

What kind of worlds and endings are rendered unimaginable, inconsequential, or ghosted by the bomb?

The contributions in this special issue are concerned with the formations of nuclear imaginaries, exploring the distribution of spectrality and injury through specific orientations, locations, and experiences while being attentive to the material reconfigurations and various coexistences of intersecting histories—and of past, present, and future more broadly. They are concerned with a unique sense of anxiety, or a structure of simultaneity, of "simultaneous others," as Maria del Pilar Blanco (2012, 7) would say. They think about the emergence of haunted landscapes and troubled subjectivities and they grapple with the allocation of agency, the identification of political intention, the acknowledgement of historical complexity, and claims of ethical accountability. In short, the authors brought together in this issue approach the nuclear through a particular idea of haunting, which prompts an opportunity to think through repressed forms of violence, in Avery Gordon's sense, in order to "bring 'something to be done' in the present" (1997, xvi) and to find "a route," or "access to that which is marginalized, trivialized, denied, disqualified, taxed and aggrieved" (1997, xviii). How do ghosts name the conditions of ontological insecurity and epistemological limits? Under what conditions do ghosts invite (collective) actions or meaningful narratives about life and death? And, what does the nuclear imaginary tell us about the past, present, and future endings of the ghostly world/worlds? Attending to ghosts as a different (*or perhaps other*) mode of sensemaking, the special issue meaningfully expands what Gordon calls "the right to theorize" (xviii) and thereby not only intimates the political weight of haunting in the context of nuclear injustice but also broadens the apocalypse as a method of knowledge—a field for thought beyond its theological tradition and a generative means of contemporary cultural politics and insightful analysis.

Just like the ghost, apocalypse reveals.

Seen in this light, the contributions in this issue not only rearticulate the terms of nuclear discourse but also reconsider the making and breaking of a variety of worlds and thereby tell us something profound about the limits and possibilities of apocalypse. As Elaine Gan, Anna Tsing, Heather Swanson and Nils Bubandt point out in *Arts of Living on a Damaged Planet*, "considered through ghosts, worlds have ended many times before" (2017, G6). Two things about haunting, then, are particularly instructive here. Firstly, Gordon insists that haunting is not simply a metaphor or a supernatural abstract, but a social phenomenon, a politics and a form of knowledge production. And secondly, for Barad (2017, G107) "hauntings are not immaterial. They are an ineliminable feature of existing material condi-

tions." Nuclear violence seeps into the earth, the air, the body (as does its erasure) and thereby reconfigures, to use Barad's expression once more, the ongoing "worlding of the world" (2018, 73). Similarly, apocalypse may be considered a method, a framework and a politics with material consequences, "an imaginative practice," as Jessica Hurley and Dan Sinykin (2018, 451) put it, "that forms and deforms history for specific purposes: an aesthetic, [narrative, or genre] that *does* as much as it represents," routinely altering the experience of temporality and space and thus not only consolidating but also rupturing the inevitability of historical injury.

Ghosts touch everything.

If haunting is not immaterial, neither is the ghost. When we come together to discuss nuclear ghosts and apocalypse then, we are interested in the impacts of nuclear violence on concrete landscapes and bodies. We are interested in how haunting shifts our understandings of temporality, how it animates repressed or unresolved forms of social violence and how it reveals opportunities for overdue justice. We look to haunting as a means to read one history through another, thereby stitching up the wounds invoked by administered forms of forgetting and political denial that ultimately sanction the repetition of political violence, and thus need to be disrupted. We also engage haunting as something that animates the material implications of social imaginations and concrete politics alike, disrupting the nuclear apparatus as a means of apocalyptic apprehension and historical repetition, or what Anne McClintock calls the "imperial déjà vu." Nuclear hauntings become tangible in the intimate frictions of lived experience and everyday life but they speak to larger structures of violence: to climate emergency, global injustice, and settler colonial endurance.

Ghosts leave traces. Erasures are material.

According to McClintock, the United States military raised a shack in the nuclear debris after the bombing of Hiroshima, and "screened a Wild West film for American soldiers" (2014, 826). McClintock reads this scene as the production of an imperial déjà vu, whereby Hiroshima had become a perverse new nuclear frontier (a projection which also extended into the Pacific) but also revealing, in true apocalyptic fashion, that colonial violence and nuclear assault had never in fact been separate forces. Such forms of ghosting, in McClintock's eyes produce "a kind of counter-evidence" in the form of material and spectral traces that summon the "shadowy after-effects" of empire (2014, 821). Nuclear haunting is thus in Eve

Tuck's and C. Ree's words also "the relentless remembering and reminding that will not be appeased by settler society's assurances of innocence and reconciliation" (2013, 642) precisely because "decolonization," as they further assert "must mean attending to ghosts, and arresting widespread denial to the violence done to them" (2013, 647). Decolonization, Tuck and Ree write, "is a recognition that a ghost is alive, so to speak. We are in relation to it and it has designs on us, such that we must reckon with it graciously, attempting to offer it a hospitable memory, out of concern for justice" (647). This includes acknowledging that those who are ghosted are often not ghosts at all, but ordinary people with ordinary lives and that nuclear ghosts conjure up a critical moment that ultimately points to lived politics as well as tangible ways of organizing and resisting.

In the end.

The ghosts we seek in this issue articulate the entanglements between atomic violence and the ongoing assaults of colonialism, sexism, capitalism, war, and environmental destruction, cathecting the apocalyptic ontologies of past, present, and future, but they also point to the intimate, to the ordinary, and the local. Hiroshima and Nagasaki, Chornobyl, and Fukushima all mark defining moments in nuclear history that have occupied collective narratives in countless ways. These instances of spectacular (and spectral) extinction have produced unsettling points of reference for extraordinary scenes of destruction. At the same time, the creeping repercussions and complex contexts of these events as well as the slow violence of nuclear testing contradict notions of exceptional or enclosed disasters, precisely because the nuclear forces itself upon a lived reality, defying linear notions of time and injury. Nuclear ghosts trouble dominant notions of temporality, spatiality, and materiality. They amend hierarchies of world-ending experiences, from the intimate to the social, from the spectacular to the ordinary, from the hegemonic to the unimaginable, and so on. They pay witness to political atrocities, while acknowledging a specific nuclear work of death as something that is simultaneously blasting and slow, fast and near, abstract and material. Nuclear ghosts, in other words, invoke the spectral domain of apocalyptic imaginaries in their various political scales, interdependencies, and ongoing urgencies.

Writing present/presence otherwise.

The special issue moves from an interrogation of the material violence of nuclearity through the lens of time, re-membering, and haunting to

specific discussions of nuclear colonialities and nuclear intimacies, before turning to examples of artistic and journalistic 'storying' of the troubling present/presence of nuclear ghosts. While this is an attempt to put these various approaches and perspectives in conversation, it will also become clear that many of the accounts have been and are, in Barad's sense, always already in touch, always already *entangled*. It is a privilege to be able to bring these entanglements to the forefront by assembling writers and artists who share a commitment to ongoing interrogation of the nuclear, particularly in its impact on concrete, material lives. I want to take the opportunity to thank them here for sharing their insightful and considerate analyses in this form.

The issue opens with Karen Barad's incisive and thought-provoking keynote lecture "Nuclear Hauntings & Memory Fields, For the Time-Being(s)," which they generously shared as part of the Nuclear Ghosts Workshop at the Käte Hamburger Centre for Apocalyptic and Post-Apocalyptic Studies in July 2023. Barad offers an agential realist reading of quantum field physics which outlines the violent application of science in the form of the nuclear bomb, particularly in its complex interrelations with militarism, colonialism, imperialism, capitalism, racism, etc., and simultaneously demonstrates that the same science is haunted (in the material sense) by the opportunity to trouble the onto-epistemological conditions it produces. Barad traces haunting as a deconstructive force that troubles time and reads time-beings as "a dynamism of differentiating entangling." Haunting, in Barad's work, is hence an activity of the world, a form of ongoing worlding, or "spacetimemattering" with vast consequences for our perception of memory, nuclearity, and apocalypse. Engaging the ghostliness of nuclear time-beings and thereby recognizing the continuous, slow, material, colonial violence exercised by the bomb, Barad works from a diffractive reading of quantum physics, Kyoko Hayashi's novella *From Trinity to Trinity*, and the poetics of Jake Skeet, in order to unfold the material entanglements between practices of knowing and ways of being that may achieve an understanding of nuclear lives and deaths that is geared towards justice and response-ability.

Gabriele Schwab's contribution elaborates on the complex issue of "Nuclear Temporalities." Schwab argues that the knowledge of the all-encompassing destructive power of nuclear weapons inaugurated a fundamental break "in the temporal order of things," producing a distinct form of haunting which simultaneously hails from the past and stretches into the future. To Schwab, the potential of total annihilation encoded in the very existence of nuclearity has subsequently left a profound mark on human subjectivity, which is tangible as a form of transgenerational

trauma, but fundamentally alters human temporality, profoundly impacting species survival and planetary scales, as well as rupturing psychic and political life. Schwab identifies the creation of "apocalyptic selves," which are profoundly haunted by the possibility of extinction and therefore require a kind of collective numbing in order to live on. This splitting of the self, to Schwab, results in a form of psychological 'death in life' and thereby points to the enduring dynamics of nuclear necropolitics. Debating the nuances of futurelessness, she asks how we can make sense of this fundamental shift inaugurated by the nuclear age.

Lisa Yoneyama's article "Co-Conjuring: Practicing Decolonial Nuclear Criticism" explores the possibilities of creating relational sensibilities across entangled nuclear catastrophes in order to challenge the colonial logic of division and partitioning. Looking at a range of cultural productions, most notably Peter Blow's documentary film *Village of Widows* (1999) and Marie Clement's acclaimed play *Burning Visions* (2002), Yoneyama traces cultural practices of haunting or what she calls forms of "radiontology." Conceptualizing a dynamic of co-conjuring that allows for "critically relational ways of knowing the nuclear" without reproducing the problematics of a facile nuclear universalism, whereby distinct forms of experience are falsely read as equivalent, assimilated, instrumentalized and thereby ultimately erased, Yoneyama is interested in co-conjuring as a way of connecting while maintaining the specificities of sovereignty, land rights, survivance, etc. Yoneyama's analysis points to the simultaneity and mutual entanglement of multilayered forms of violence, invoking a polyvalent, multi-varied, and intersectional practice of relational justice across times and spaces. Reordering the workings of nuclear power, from Canada to Japan, from nuclear disaster to settler colonialism, and finally to environmental emergency, Yoneyama's contribution appreciates radical interconnectedness as a form of decolonial nuclear criticism.

In her article "The Pikinni Ghost: Nuclear Hauntings and Spectral Decolonization in the Pacific" Jessica Hurley continues to theorize the means of nuclear de/colonization "as a mode of living with ghosts." Drawing on the US-led 1957 return of the Roñļap community to Roñļap on the one hand and Kathy Jetñil-Kijiner's 2018 video poem *Anointed* on the other, Hurley's contribution highlights different conceptions of the 'Bikini ghost', intimating how these apparitions sit within a continuum of colonial violence. While the obsessive repatriation of the Roñļap community is read as a Western attempt to exorcise ghosts and settle "all claims, past, present, and future" once and for all, Jetñil-Kijiner's poem serves as an example of relational mourning, whereby the nuclear ghost is incorporated within Marshallese structures of kinship and care, opposing the logic

of nuclear settler colonialism. Hurley argues that in treating 'The Tomb' on Runit Island as a relative that requires ongoing care, Jetñil-Kijiner disrupts colonial temporalities that seek to bury the past and instead develops a form of decolonial sovereignty that accomplishes "a form of anti-nuclear worldmaking" through ongoing practices of Marshallese survivance.

Annelise Roberts' discussion of nuclear imperialism moves the focus to Australia, unpacking the implications of British nuclear testing in the 1950s and 60s. Roberts' contribution "Atomic Totem: Australian Settler Nuclearism, the Disavowal of Aboriginality and Morbid Reconciliation" reads the British practice of naming nuclear testing sites and operations with the help of Indigenous languages, symbolism, and imagery — routinely mis/using such words and representations — as a way to imbue the nuclear complex with a "vague sense of Aboriginality." Roberts situates this tendency within the context of what she identifies as a complex process of disavowal within the Australian settler imaginary, whereby the relationship between colonizer and colonized is simultaneously denied and brought to the forefront in an attempt to navigate an ongoing and unbearable intimacy. Roberts argues that the practice of indigenizing nuclear power points to unacknowledged contradictions that stem from settler colonial violence and thereby marks an attempt to 'totemize' the bomb as a way of binding settler state and Indigenous in a morbid kin-like relationship, which is only principally capable of imagining a common future through the possibility of shared annihilation, or what Roberts calls "a kinship of apocalypse."

Roxanne Panchasi's contribution "'You don't screw with the Sahara': Radioactive Dust and the Return of the French Imperial Repressed" takes up the eerie phenomenon of tons of "lightly radioactive" Saharan sand appearing in France in 2021 and 2022, which created a visually striking, golden dust raining down on the French landscape and turned it into a post-apocalyptic setting from which to examine the imperial past, particularly in its link to French nuclear testing in the 1960s in the Sahara desert. Invoking the troubled colonial history between France and Algiers, Panchasi explains that the appearance of the dust served as a catalyst for debates about French imperial legacies in the context of the COVID-19 pandemic and ongoing threats of climate change. Largely read as a "postcolonial boomerang," the phantom dust thereby tapped into a specific historical moment in which the configurations of toxicity and imperial debris were already performing a metaphoric purpose in giving meaning to the unresolved histories between France and Algiers in the context of these new crises. In engaging this uncanny specter, Panchasi asks what concrete actions the revelatory capacity of this apocalyptic sand might serve.

Shifting the lens to the intimate of slow nuclear violence, Marisa Karyl Franz examines the haunting of ordinary affects in the still-life of nuclear disaster. Franz's contribution "Ordinary Haunting in Irradiated Land" looks at three art projects invoking the legacies of Chornobyl and Fukushima through "the mundane material of everyday life." The article draws attention to the durational intimacy of nuclear disaster, turning to everyday life as the focal point for a spectral presence. Franz unpacks the ordinary as saturated with meaning and affect and thereby highlights the ways in which disasters disrupt but also produce specific forms of normalcy that require a particular ethical relationality and avoid the repetition of nuclear violence in the very act of its representation. Discussing the intricacies of nuclear intimacies in relation to Michael Marder and Anaïs Tondeur's *Chernobyl Herbarium* (one of the project's photographs is also serving as the cover image of this issue), Eva and Franco Mattes' *Fukushima Textures* and Ai Weiwei's *A Ray of Hope*, Franz traces the myriad ways in which the art of ordinary still-life produces a specific channel for mourning the loss of familiarity, routine, and home with recourse to the materiality of the everyday.

Staying with the experience and materiality of nuclear contamination, K.M. Ferebee looks at the polysemic meaning of "Chornobyl," particularly in the context of the Russian invasion of Ukraine in 2022. Ferebee's article "'A New Chernobyl': Narratives of Nuclear contamination in Russia's 2022–3 Ukraine War" examines how media narratives surrounding the invasion conceptualize "Chornobyl" as a site of Ukranian national identity that points to an incorporation of the toxic (rather than its refusal). Ferebee argues that the way Chornobyl's toxicity is embraced in the Ukrainian national imaginary runs counter to established "toxic discourse," insofar as the mobilization of the nuclear as a treasured wound and potential ally (against Russian aggression) resists notions of the Exclusion Zone that either rely on fantasies of prenuclear purity or deadly apocalyptic destruction. Instead Ferebee explains that the area might also point to an ongoing intimacy with danger, suggesting a world that has never been 'whole' to begin with. Beyond the signifying power of "Chornobyl," Ferebee is interested in lived experience and material sites that do not position the apocalypse as a future threat but encounter it as an ongoing reality, tied to unexpected processes of sense making.

In her contribution "Mediation and Autobiographical Ghosts," Katherine Guinness takes up the personalized responses of journalists to a widely circulated video by the New York City Emergency Management which gives advice on how to prepare for a nuclear attack. Discussing these intimate details in their relation to ongoing nuclear disaster, Guin-

ness explores the autobiographical as a way into understanding how the nuclear mediates the present as a spectral apparition. Arguing that everyone today is rendered a ghost, stuck in the enduring afterlife of nuclear realization, Guinness traces a contradiction between the unimaginable and impersonal that commands a desire for relatability and intimacy. The ghosts in Guinness‘ argument are haunted by their own lack of agency, the inaccessibility of the past, and the loss of future, or what she develops as 'negative hauntology'. In this scenario "nuclear apocalypse has happened and is yet to come," which creates a kind of refusal of the present that Guinness seeks to challenge. Resisting the individuality of the ghost, Guinness pleads for "a renewed collective responsibility to the present," in which we learn to live with ghosts and thereby ultimately learn to live with ourselves in the wake of the nuclear.

In addition to these academic writings, the special issue also highlights the voices of artists and journalists. Melanie Le Touze and Zackie Schneyder's ongoing project on the Brennillis plant in Monts d'Arrée in Finistère, France—the 'end of the world' in Breton—traces nuclear ghosts through a combination of photographs, interviews, and philosophical reflections. Le Touze and Schneyders collect the stories that emerge in this haunted environment, approaching the impact of nuclear technology with respect to the legends and myths of the region. Using lomography, a photographic technique geared towards the experimental and unpredictable, admitting flaws, blurs, unusual lighting and unexpected perspectives, the project makes visible the ghostly quality of this endeavor but also emphasizes the political implications of nuclear experience. Presenting excerpts from this work in progress, here titled "The Brennillis Plant, A Nuclear Ghost at the Gates of Hell," Schneyders and Le Touze illuminate the ongoing fantasies, lived structures, and ambivalent imaginaries surrounding the decommissioned power plant.

Taking the issue full circle, back to the beginning of the end, Elva K. Österreich's contribution "Experiencing the Trinity Test in New Mexico" presents excerpts from her 2020 book *The Manhattan Project: Witnessing the Bomb in New Mexico* in which she recounts the initiation of the first blast through the eyes of those closest by. A journalist in Southern New Mexico for more than two decades, Österreich has spent years collecting the stories and accounts of eyewitnesses, scientists, and journalists who were present at the detonation of the first bomb. In this selection, she gives detailed insights into what happened on the day, recounting various perspectives and testimonies. At the same time, Österreich's storytelling also draws attention to both, the intimacy of the experience and the flexibilities of memory that go along with this. Gesturing to various ongoing

attempts to receive acknowledgement and compensation for the loss and enduring repercussions that many have experienced, Österreich's account not only provides a lens into various mnemonic snapshots of the Trinity Test but also works as a reminder that such memories are contested, malleable, and ultimately political.

Finally, Theresa Meerwarth closes the issue with a review of Gabriele Schwab's 2020 book *Radioactive Ghosts*, discussing its various implications for thinking the nuclear in terms of temporality, psychology, politics, and apocalypse, thereby revisiting many of the topics (and ghosts) summoned throughout this issue.

A final word of warning: Ghosts. are. frightening. They cannot be appeased. Nor should they be.

While haunting subsumes an apocalyptic world, it is not strictly concerned with ending things—neither does it necessarily aim at reconciliation, conclusion, or hope. Rather haunting is geared towards ongoing commitment, perseverance, and the refusal to stop. As Tuck and Ree put it, "for ghosts the haunting is the resolving, it is not what needs to be resolved." Similarly, Derrida reminds us that the ghost is somewhat ambiguous and incalculable: "[o]ne cannot control its coming and going" (Derrida 2006, 11). Ultimately then the ghost's prerogative is not inevitably to be understood. In fact, the attempt to fully disavow the ghost's opaqueness suggests a certain kind of troubling repetition—a form of familiar mastery and a well-worn kind of occupation, both of which are at the very heart of the erasure, denial, and conquest subsuming the power structures that have brought about the nuclear bomb. The aim of attending to ghosts hence cannot be to lay those ghosts to rest, so to speak, in fact such a wish or goal, too, bespeaks a certain kind of violence reproduced in the form of purging, closure, or catharsis. Just as nuclear violence escapes this kind of "ending," the ghost produces a strange present/presence that undercuts attempts at control. Rather than aiming to disclose—in true apocalyptic fashion—'the truth' about nuclearity, this issue hence attends to ghosts in order to sit with them, to live with them, to learn with them, and in some sense to *unend* them. In this way, the contributions in this issue create a particular orientation towards the enduring apocalypses—towards ongoing trouble, tenacity, and transformation. This kind of engagement is difficult, ambivalent, and necessarily incomplete, but it abides to the ghosted precisely because as Avery Gordon (1997, 208) concludes her *Ghostly Matters*, and I this introduction at last:

"*the ending which is not an ending at all belongs to everyone*."

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Karen Barad

Nuclear Hauntings & Memory Fields, For the Time-Being(s)

(Keynote for Nuclear Ghosts Workshop, CAPAS, Heidelberg, Germany, 26 July 2023)

It's early July 2023. I am sitting at my desk reading today's news. I reside on the unceded traditional territory of Huichin, the ancestral homeland of Chochenyo-speaking Lisjan Ohlone people. Lisjan Ohlone Tribal Chair Corrine Gould, has co-founded and co-directs the Sogorea Te' Land Trust—an urban, women-led organization that engages in practices of rematriation, cultural revitalization, and land restoration. Sogorea Te' calls on native and non-native peoples to heal and transform the legacies of colonization, genocide, and patriarchy. The Trust, in partnership with Planting Justice, has been caring for all inhabitants in need in the East Bay by providing food during the pandemic, engaging in a practice for the flourishing of all beings.[1]

Within a few miles is the Berkeley campus of the University of California, which oversees the nearby Lawrence Livermore National Laboratory which together with Los Alamos National Laboratory (in New Mexico) has been the United States government's primary institution for nuclear weapons research and development. It is July 5th, not a particularly exceptional day, news-wise; it is simply the day I am making some notes with this talk in mind. Despite the fact that, for the most part, the news has given scarce attention to nuclear issues since the end of the Cold War, nuclear matters have a way of refusing containment and nonetheless leak into things. Indeed, *far from being locatable in space and time, nuclear matters attest to the undoing of spacetime localization and the givenness of such coordinates.*

Today is a week and a half before the anniversary of the first atomic bomb detonation— Trinity Test, which took place on July 16, 1945 at

1 I begin by situating myself in spacetime only to problematize the possibility of locating oneself or even an event in space and time. What is at issue, rather, is the dynamism of spacetimemattering in its iterative intra-active reconfiguring/re-membering.

5:29 am in Jornada del Muerto desert within the state the colonizers call 'New Mexico'. I'm sipping my morning coffee and looking at the day's headlines on the NPR website (among several I read), and two of the top stories for the day are news items about nuclear issues. One headline—"Ukraine's Zelenskyy warns of possible Russian sabotage at nuclear plant" (Myre 2023)—speaks to a critical point anti-nuclear activists and others have made for decades: it is impossible to draw a line in the sand separating issues of nuclear power from that of nuclear weapons, giving lie to the alleged division between nuclear power and nuclear powers. The possibility of using the Ukrainian Zaporizhzhia Nuclear Power Plant, the largest in Europe, dwarfing Chernobyl, as a weapon has been an active threat, a ticking timebomb, for more than a year now, in the aftermath of Russia's opening move in the invasion of Ukraine—a noteable strategic move: to capture the nuclear power plant.[2]

The other story, "The U.N.'s nuclear watchdog says Japan can release nuclear waste water into the ocean," (Westerman 2023), tells of a plan to pour more than a million tons of radioactive waste water, left over from the Fukushima Power Plant disaster of March 11, 2011, into the Pacific Ocean, with the blessings of the International Atomic Energy Agency which promises oversight of the release over the next 30–40 years. Approval was granted despite the fact that the "plan has drawn significant criticism from the scientific community." Critics also cite the fact that this is a "transboundary issue" that will not only affect Japan. Reading this, I am pleasantly surprised that the article mentions the nearly 70 atomic bombs the US exploded in the Marshall Islands from 1946–58, which turned the small nation state into an open-air and water laboratory, and it actually goes on to make the direct connection: "many across the Pacific say the waste water release plan is a continuation of the Pacific's traumatizing relationship with nuclear technology and harkens to a past when larger powers used their islands—and their people—as collateral damage to further their nuclear ambitions" (Westerman 2023). Nuclearity blows up Newtonian conceptions of space and time. Nuclearity is inherently a haunted matter, where time is out of joint.

•••

> If I am getting ready to speak at length about ghosts, inheritance, and generations, generations of ghosts, which is to say about certain *others* who are not present, nor presently living, either to us, in us, or outside us, it is in the name of *justice*. Of justice where it is not yet, not

2 Both articles are published on NPR.org website. NPR stands for National Public Radio.

> yet *there* … It is necessary to speak *of the* ghost, indeed to the ghost and *with* it. … No justice seems possible or thinkable without the principle of some *responsibility*, beyond all living present … 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 it be to ask the question 'where?' 'where tomorrow?' 'whither?'—Derrida (1994, xix).

> *A pine tree is time, … and bamboo is time. Mountains are time. Oceans are time. … If time is annihilated, mountains and oceans are annihilated … Time itself is being … and all being is time … In essence, everything in the entire universe is intimately linked with each other as moments in time, continuous and separate.*—Ruth Ozeki (2013,30, reordered).

For Derrida, hauntings are matters of injustices and untimeliness, matters of time out of joint.

Time presses down upon us these days. Its face pressed against ours. Apocalyptic narratives proliferate and weigh on us. If one apocalypse or another, or a conjunction of multiple ones, doesn't get us, at least not yet, there is nonetheless a sense of impending doom, of a future already squandered. But the very notion of apocalypse, which is always coming, in every epoch it seems, is premised on a future-facing linear construction of time, that serves the workings of racialized capitalism, imperialism, and colonialism, denying past apocalypses and how they live on. There's a deadly sense of forward-facing directionality and inevitably built-in—an end time—a time that kills time.

And all the while, in these times, there is the constant background hum of 'uncertain times' as if time is already set, as in a great clockwork, an invention some deity set in motion at time t=0 and watches as history is revealed, bit by bit. It will all unfold, given enough time. It's just that, at least for now, we don't yet know what will happen: the future is out in front and uncertain, that is, unknowable, for now. But that in itself is a trap. The future isn't given, out there, awaiting our arrival. The future—THE future … wait! This notion of 'the future' is in itself already problematic in that it assumes futurity is one … so I will interrupt this sentence rather than running with it to its presumed inevitable conclusion. What if futurity is understood not as a matter of uncertainty, but rather of indeterminacy? The notion of uncertainty sits happily with the idea of clock-time. Whereas indeterminacy opens up possibilities unthinkable within the structures of clock-time. The political difference is enormously consequential.[3]

3 For an in-depth discussion of the differences between epistemological uncertainty and ontological indeterminacy see Karen Barad. 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*, Durham: Duke University Press.

Futures are not inevitable, neither are they all out in front. It's important to get the uncertainty trope—this repetitive drumbeat—out of our heads, out of our bodies, and the ways we comport them and think about what they can and can't do, to interrupt this imaginary that, among other things, mutes the polyrhythmic silent cacophony of nothingness, the infinite material possibilities, including re-turning to a past that may yet have been, an infinity of infinity of material wanderings/wonderings that live inside *this very Now*—this Thick-Now–that dances like ripples on an ocean of yearning. That is, the uncertainty drumbeat mutes the play of the virtual which is not only inseparable from materiality but contributes to its very constitution. For time is not the continuous flow of moments that pushes forward without any worldly concerns; rather, time in its materiality is integral to the dynamism of spacetimemattering, a dynamic field of material possibilities.

To allow for the dynamism of time in its materiality is crucial. This may include the fact that the future is not out in front, and the past, far from being left behind, is alive in the Thick Now of the present moment, and that time doesn't move along in a line, as a succession of moments, but rather entails an infinity of possibilities such as asynchronicity, indeterminacy, superpositions, and entanglements—all manner of interruptions of the ordering of past, present, and future in their presumed presences and sequentiality. Crucially, temporality is <u>not</u> limited to specific matters of the human experience of time. The point here is not merely to call out another instance of human exceptionalism.[4] But, additionally, to bring to the fore a further assumption that usually goes unacknowledged: that 'humans' (in their differential constitution) are thereby understood to be of a fundamentally different ontological order than time, albeit subject to it. As if 'the human', as its own kind of independent presence, simply shows up on a stage called 'history' or 'the social' at some moment <u>in</u> time. And as if experience is to be understood as a perceptual lens that filters and reorders what *actually* unfolds <u>in</u> time. The point is that this ontological splitting positions the human as its own thing independently of the landtimescape (or so-called 'environment') within which it appears, as if that which matters–the human—is the other to its situatedness along with the notion that there is a reality "out there" that exists independently of human beings who take up positions at given coordinates in space and time.

But what if time—spacetimemattering—has another face, another history, another sense of being? What if time-being is understood—that is, touched into—as a matter of touching, of being in touch, being touched by everything and nothing?[5] In this sense of mattering, not even

4 Importantly, 'humans', in all their power-inflected political socialities are deemed exceptional in ways that undergird hierarchies of race, ableism, colonialism, hetero-cis-normativity, and other forms of violence predicated on calculations of lives that matter.

5 I propose a notion of time-being through my work on an agential realist interpretation of quantum field theory independently of Ruth Ozeki, whose notion shares some deep resonances with my own, and which I deeply admire. For example, see Karen Barad. 2017b. "Troubling Time/s and Ecologies of Nothingness: Re-turning, Re-membering, and Facing the Incalculable." *New Formations: A Journal of Culture/Theory/Politics* (92): 56–86.

the great divide — perhaps the ultimate divide — deeper even than the seemingly unbridgeable divides between life and nonlife, organic and inorganic, animate and inanimate — the very divide that undergirds all the other divides — that between existence and nonexistence — can be taken as given? If the nature of existence/nonexistence is not a binary but rather an indeterminacy cut together-apart that undermines ontology in favor of a hauntology, thereby calling into question the belief that there exists some ontological division(s) that can justifiably be assumed from the outset. Which far from being the same thing as a flat ontology, resists any such notion, and instead entails a hauntology that is a dynamism of differentiating-entangling.[6]

In my agential realist reading of quantum field theory, time-being/becoming is an activity of the world in its materiality. Beings do not inhabit or take a place, but rather are *of* the landtimescape — the spacetimemattering of the world in its sedimenting enfoldings of iterative intra-activity. Time-beings are excitations of the field of spacetimemattering, and are inseparable from nothingness, from all possible yearnings, imaginings, desirings to be-come.

And relatedly, “memory does not reside in the folds of individual brains; rather, memory is the enfoldings of space-time-matter[ing] written into the universe, or better, the enfolded articulations of the universe in its mattering. Memory is not a record of a fixed past that can be … erased, written over, or [simply] recovered … And re-membering is not a replay of a string of moments, but an enlivening and reconfiguring of past and future that is larger than any individual” (Barad 2007, ix). That is, memory is not merely a subjective capacity of the human mind; rather, ‘human’ and ‘mind’ are part of the spacetimemattering of the world. Memory is written into the worlding of the world in all its specificities. Or rather, memory is constituted in and through the world’s iterative re-configurings/ re-memberings … The world ‘holds’ the memory of all configurings and iterative reconfigurings; or rather, the world *is* its memory/re-memberings.[7]

This agential realist tale of time-beings and memory is a hauntological matter. Importantly, agential realism is not reducible to quantum physics. It is not even premised on quantum physics (a statement that assumes a given ground that I question). But rather, as part of agential realism I offer an agential realist relational ontology interpretation of quantum physics. This is not an innocent interpretation, but it is a legitimate contender among competing interpretations of quantum physics, where ‘legitimacy’ is traditionally conferred by physicists studying the foundations of quantum mechanics. And that’s important — because it means that it is possible to engage in a practice of doing physics differently. In particular, by

6 Derrida’s notion of spectrality is helpful here. “If it—learning to live—remains to be done, it can happen only between life and death. Neither in life nor in death *alone*. What happens between two, and between all the “two’s” one likes, such as between life and death, can only *maintain itself* with some ghosts, can only *talk with or about* some ghost [*s’entretenir de quelque fantôme*]. So it would be necessary to learn spirits. Even and especially if this, the spectral, is *not*. Even and especially if this, which is neither substance, nor essence, nor existence, *is never present as such*. … to learn to live *with* ghosts … To live otherwise, and better. No, not better, but more justly. But *with them*. No *being-with* the other, no *socius* without this with that makes *being-with* in general more enigmatic than ever for us. And this being-with specters would also be, not only but also, a *politics* of memory, of inheritance, and of generations.” (Derrida 1994, xviii–xix). For me, this speaks to the question of ontological indeterminacy in its hauntological sense(ability).

7 See also Karen Barad. 2010. “Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, SpaceTime Enfoldings, and Justice-to-Come.” *Derrida Today* 3 (2): 240–268.

incorporating and understanding insights derived from theories of justice as integral to the practice of science.

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Matter fell from grace during the twentieth century. What was once labeled 'inanimate' became mortal. Very soon after that, it was murdered, exploded at its core, torn to shreds, blown to smithereens. The smallest of smallest bits, the heart of the atom, was broken apart with a violence that made the earth and the heavens quake. In an instant, in a flash of light brighter than a thousand suns, the distance between heaven and earth was obliterated—not merely imaginatively crossed out by Newton's natural philosophy but physically crossed by a mushroom cloud reaching into the stratosphere.

In order to sense into how agential realism refigures time in terms of *spacetimemattering*, it is important to touch upon how making sense is a matter of touching, sensing, being in touch. Touching is always already about re-turning, re-membering, coming back around again, anew.[8] For if in telling time—or rather, spacetimemattering becoming a telling of "us"—we take a moment to examine how so many disciplinary and interdisciplinary fields are always already thinking with core concepts in physics, such as space, time, matter, causality, and more, the analysis must entail not simply trading Newtonian ideas for the cool stuff of quantum physics, but also crucially, the tracing of entanglements of the very violences that physics helps produce, as part of bringing forward alternative imaginaries in their materiality. In other words, it is crucial to re-member, to take stock, to re-turn—to turn over and over again the remains of history that get encrusted and unloosen the ghosts that were assumed to be laid to rest and long forgotten. Spacetimemattering is a field of re-memberings.

Nuclearity blows up Newtonian conceptions of time as given, as sequential, as moving forward independently of all happenings. Nuclear bombings are not events <u>in</u> time. They occupy time, colonize it, do violence to it. Nuclear bomb blasts are not a set of independent events situated in space and time. Nuclear time-beings are specific configurings of the field of spacetimemattering: a memory field where ghostliness haunts time itself.

Nuclear time-beings are always already ghostly. Untimeliness is their brand, their very nature. Deep time, both deep histories and deep futures, intergenerational mutations, out-of-time(li)ness itself leeching into bones, ground water, atmospheric particulates of split-seconds raining down, frozen bits of time hardened into glassy residue, shattering histories

8 For a more detailed discussion of my agential realist conception of touching see Karen Barad. 2012. "On Touching – The Inhuman That Therefore I Am." *differences: A Journal of Feminist Cultural Studies*, Special Issue "Feminist Theory Out of Science" 23 (3): 206–223.

and futures measured out as after-lives, half-lives: half of a half of a half … counting radioactive bits without end.

The very existence of nuclear decay undermines eventfulness, writing a temporality of indefinite ongoingness into the core of radioactive material existence. Nuclear decay is not a singular happening. It pervades time. For example, Pu-242's decay time is 376,000 years meaning that in 376,000 years half of the Pu-242 sample will have decayed, in another 376,000 years, a half of a half will have decayed, and so on. Radioactivity counted out across innumerable generations, left ticking eons beyond time.

Nuclear time-beings are matters of quantum physics. Physicists began working on quantum field theory (QFT) starting in the late 1920s, but quickly ran into difficulties—most seriously, the so-called 'infinities problem', which was not resolved before the war. Histories of physics mark the war effort as specifically interrupting the development of the theory, at least in the West, because the same physicists who were hard at work on QFT were called on to work on and take the lead on the development of new military technologies. This is not a coincidence. Nuclear physics developed alongside and inside QFT, and many of the top physicists around the world were working on both. Skills, techniques, approaches to cracking hard problems, and more, were traded back and forth between military research and the most abstract efforts in theoretical physics. In many ways, for physicists around the globe, the war effort was dis/continuous, with work in 'pure' theoretical physics. It is perhaps no surprise then that at the very core of QFT are traces of militarism, colonialism, and racialized capitalism, together with fundamental questions of the nature of being and time that have the potential to explode the grammar and logics of radioactivity's assumed naturalness.

The clocks were arrested in Hiroshima on August 6, 1945 at 8:15 am. Time stopped. Its internal mechanism melted. What happens to time when nuclear forces are harnessed and unleashed on command? Is it not the very fabric of time-being that is being ripped apart, shredded into bits? Vaporized, dispersed, made particulate, whisked away on the breeze? Condensed into raindrops that fall to the ground making puddles on streets and quenching the soil's thirst? Sent up in smoke as the water invades the electrical systems of nuclear plants, Leaked into the groundwater as the nuclear core melts? Time is/was/has been crossed out. Time drawn out like taffy, twisted and swirled in the form of hot metal, cooled, hardened, and splintered. In the twentieth century, time is given a finite lifetime, a decay time, an afterlife. Moments live and die (Barad 2017,103–106).

The Hiroshima bomb continues to go off. In the immediate aftermath of the bombing, those who had survived the blast instinctively made their

way to ground zero, making the usual kinds of assumptions about the nature of a conventional bomb, which is limited in scope to an event, to look for survivors. But this is no ordinary bomb. And it hadn't finished going off and still hasn't. Many who went to check were further exposed to radiation and they died. Others lived, but their cells tick like little time-bombs that explode into cancers, or they pass mutations on to future generations. Living and nonliving beings become carriers and transmitters of radioactivity, without end.

As a physicist, I take it that is my response-ability, to make evident the forces of violence that exist not only in the applications of science, but inside its very core—in the epistemological, or rather, onto-epistemological workings of the theory itself. And to interrupt the violent storied-materialities physics has been bringing into the world, and bring forth alternative storied-material practices—new-old practices of knowledge-world-making—that include holding the sciences accountable in ways that are integral to the very practice of science. I have argued that what we call physical forces—such as the nuclear force—and what we call social and political forces are not separable, and that objectivity is a matter of tracing the entanglements of various forces in their specificities, and as such, this matter of tracing entanglements is an integral part of the practice of science itself.

When it comes to nuclear landscapes, vaporized bodies and other losses may not be visibly discernible, but they are surely not intangible. There are losses emblazoned on walls: shadows of what once was become eternal… the flash so bright, the heat so hot, nearly every surface becomes a photographic plate. Loss is not absence but a marked presence, or rather a marking that troubles the divide between absence and presence.

These devastated landtimescapes are surely haunted, but not merely in the sense that witness's memories of the dead, of past events, particularly violent ones, linger there. Hauntings are not immaterial. They are an ineliminable feature of existing material conditions.[9]

In "Troubling Time/s and Ecologies of Nothingness: Re-turning, Re-membering, and Facing the Incalculable," (2018) I diffractively read quantum field theory—the basis for nuclear physics and the making of an atomic bomb—through a novella *From Trinity to Trinity* by Kyoko Hayashi—a story of re-turning—wherein a survivor of the Nagasaki atomic bomb seeks an embodied way to re-member her 52 classmates who were incinerated and thereby robbed of their own deaths. Her practice of re-membering entails tracing the Pu-bomb that was dropped on Nagasaki back to the Trinity test site, the first place a Pu-bomb was exploded, in the desert of the place the colonizers call 'New Mexico'.

9 See photo below.

Figure 1. Lessons-From-The-Shadows-of-Hiroshima-ft.-Christianus-Iscariot-YouTube-2016-08-07-15-22-25.

The body clocks of *hibakusha*—nuclear bomb survivors—have been synchronized to the bomb. Their cells tick with the rhythms of radioactivity: half-lives, indeed. Passed along to future generations through mutations, the bomb continues to go off all these years later while nuclear violences cancel out futures. Individual and collective. Even deep futures. How to ensure the safety of buried radioactive elements? Half of a half of a half of a half … counting time out by the tens of thousands of years, hundreds of thousands of years, … possibly beyond human time.

Tracing entanglements is an embodied practice of re-membering—which is not about returning to what was, but rather, about materially reconfiguring spacetimemattering in ways that attempt to do justice to account for the devastation wrought and to produce openings, new possible histories, reconfigurings of spacetimemattering through which time-beings might find a way to endure.

While the dominant American imaginary is that only two atomic bombs have ever been exploded—the devasting blasts that killed more than 175,000 people in Hiroshima and Nagasaki—and that these two isolated incidents ended a war—during the so-called Cold War more than 2,000 nuclear bombs were detonated, the overwhelming majority of them on indigenous lands. A powerful way to get some (albeit limited) sense of the magnitude of the onslaught of nuclear "tests" that disintegrated islands, left massive craters in the ground, and contaminated lands for time immemorial is the video art work entitled *1945–1998* by Isao Hashi-

moto, which in its powerful audiovisual effects gets the point across quite strikingly that the so-called 'Cold War' was anything but cold.

And this doesn't even begin to count the colonizing forces of slow (and not so slow) nuclear violence that are an integral part of the nuclear fuel chain — including uranium mining, uranium processing, and nuclear waste storage — which disproportionately affects Indigenous Peoples. For example, the U.S. Environmental Protection Agency and the Navajo Nation have identified more than 523 abandoned uranium mines scattered throughout Arizona and New Mexico, including dozens located dangerously close to homes or water sources.[10]

Diné environmental activist Leona Morgan points out that the uranium fuel cycle is a matter of ecocide and resource colonization. For example, the world's largest uranium spill occurred at the Church Rock Uranium Mill on private land in New Mexico, where a damn broke pouring 100 miles of liquid uranium waste onto Diné lands. Despite the fact that this was the largest release of radioactive materials in the U.S., and occurred just three months after the accident at Three Mile Island, few people have heard about it. And because of the vast uranium deposits on Diné lands, fracking can bring up uranium as well as radon. Furthermore, during the pandemic, Diné people faced the highest rates of COVID-19 in the United States. Environmental injustices are never just one.

Apocalypse upon and apocalypse after apocalypse. And, even so, or maybe just so, Diné poet Jake Skeets, speaks of a decolonial sense of hope in terms of deep time pushing up from the ground, moving vertically, breaking through the encrusted soil of colonialism with its structures of horizontal linear time, the narrative of time as progression, the universalizing time of colonialism and disaster capitalism (Skeets 2020).

Physics has a history of being the helpmate of militarism, colonialism, imperialism, capitalism, racism, and other forces of violence. But physics is not a totality. And so, it is worth asking: If for all its multiple forms of complicity, are there are nonetheless openings that exist within physics that trouble its hegemony, its authority, its unapologetic epistemological imperialism that claims to cover all of space, time, and matter? Is it possible that inside the material practices of physics we might find radical political imaginaries that are resources for the flourishing of all beings, rather than destruction; for justice, rather than the perpetuation of violence? Facing the particular violences of nuclear colonialism, for example, which disproportionately affects indigenous peoples, we might ask: Is it possible to refigure the theory behind nuclear physics—quantum field theory—in such a way that it is response-able to insights from indigenous ontoepistemologies focused on relationality, reciprocity, and responsibility?

10 I am grateful to Diné anti-nuclear activist Leona Morgan for lending me some of the images and statistics that I included in my talk.

Jake Skeets writes poetically, powerfully, and compellingly about the role of what he calls "radical remembering" in pushing "forward into a new realm of thinking about memory, time, and land." For Skeets, "memory is a touchy thing, in that you can touch it." It is not at all something ephemeral, but a physicality tied to land. He even talks about memory as being "literally scarred into" his body. The materiality of memory is crucial to his politics and his poetics. Skeets (2020) writes:

> Memory is a physical construction. While memory is normally associated with the cognitive functions of the brain, I argue that memory's connection to time imposes its existence onto physical space as much as it does onto cognitive space. I am always fascinated by the idea that the starlight we see today is in fact old light cast out from a time existing simultaneously in the past, present, and future. The star's light began in its present, a past to us when we see it in our present, which is the star's future. …[B]ecause sunlight takes 8 minutes and 20 seconds to reach the earth, the things we see are in some way a part of the past. Pasts, presents, and futures exist simultaneously.

At this point, I want to acknowledge a kind of weaving that is already patterned into this talk, in the braiding/diffracting of three sources of illumination in the night sky, as it were—into a constellation. The three are: my agential realist reading of QFT (already a diffractive storied-materiality threaded through with insights from theories of injustices), my diffractive reading of Kyoko Hayashi's novella, *From Trinity to Trinity*, on re-membering the entanglements of Nagasaki and Trinity, and the material-poetics of Jake Skeets on the physicality of memory, the matrix of time, memory, and land—placing them in constellation with one another—making a weave, hinting at a diffractive reading of each through the other. Diffraction refuses the logics of analogy and parallelism, and the temporality of the new. What I am proposing is not a matter of weaving together allegedly independent threads now, for the first time, as it were; it is not a matter of my putting them in conversation with one another for the first time, since they are already materially entangled. These storied-materialities are each their own unique weavings—threaded through with differentiated-entanglements—while each is ultimately (differentially-)entangled with the others. Constellations in their patterning-together are made up of the twinklings of different yet entangled histories. So it is with respect for their deep differences, but in acknowledgment that they are already materially in conversation with one another, already intra-dependent and co-constitutively entangled, that I make this small offering.[11]

11 At this point in my presentation I displayed, for inspiration, a work of art, "Dancing on Mars," by Linape citizen of Delaware Tribe of Indians, scholar-artist Joanne Barker. Many thanks to Joanne for her kind permission.

From Trinity to Trinity is not a Western time-travel novel, but a time-hopping chronicle of one particular infinite moment of time, a time-diffraction/time-superposition tale, an embodied pilgrimage committed to tracing the material entanglements: a risky journey of placing one's body in touch with the materiality of specific colonizing histories — an embodied partial accounting of all possible histories, an iterative circling back around — touching the infinite alterity that constitutes a point, a moment. What is the structure of the infinity of a moment labeled (on some calendars as) August 9? Re-turning to a moment to face the incalculable (Barad 2017b).

For Skeets, memory is material, a physical feature of the world:

> Memory is woven in a unique matrix with land, language, and time. Native people have already mastered time travel: they are able to conjure the deepest parts of humanhood through the act of memory. Radical remembering, then, has the potential to teach a way of being that isn't tied to a capitalist future but is instead reliant on the self's engagement with the natural world. I don't mean that we should return to precontact Native life, but we should push forward into a new realm of thinking about memory, time, and land.

Standing before a photograph of an arial view of Nagasaki after the bombing on August 9, 1945, in the National Atomic Museum in New Mexico, Hayashi's unnamed protagonist jumps in time but continues the thought, asking herself: What is the story of this very land that the museum stands on — why here? What is the connection of this land to the obliterated Japanese city shown in the photograph? On her way to Trinity Site, New Mexico, Hayashi traces the entanglements of histories of violence all co-existing in this Now: including those of European colonial conquest of Native American peoples and lands, entangled with the testing of the plutonium bomb on indigenous land in the desert of what the colonizers call 'New Mexico', entangled with the same kind of bomb being dropped a month later on Nagasaki, entangled with uranium mining and nuclear-waste buried on indigenous lands in the American Southwest, entangled with the Fukushima disaster, entangled with existing and future cancers of all the atom bomb survivors and their offspring, including the (human and nonhuman) 'no-bodies' who were downwind from the Trinity test site (Barad 2017b).

"Memory," Skeets (2020) explains:

> exists as a kind of spatiotemporal entity, because time, memory, and land are woven together. One cannot look at the Grand Canyon without conjuring the deep time needed to create it. … I grow weary of the word 'spatial,' because I am more interested in the idea of a terrestrial-temporal matrix. I call this terra-temporal matrix the 'memory field' because of memory's unique engagement with time and land. Time is terrestrial and feeds our cognitive development and relationship to the universe itself. The word 'terrestrial' also grows heavy; it has similarities with words like 'sublunary,' which place the terrestrial opposite a religious or spiritual space. The word 'temporal' isn't adequate either. The memory field is a matrix of time, memory, and land. Land's connection to time feeds our development as human beings, and understanding this connection strengthens our relationship to the universe itself.

In my agential realist reading of quantum physics: Spacetimemattering is a dynamic ongoing reconfiguring of a field of relationalities among 'moments', 'places', and 'bodies' (in their inseparability) … Memory is written into the very fabric of the universe. Time-beings/becomings are excitations and condensations of a mattering-fielding of time-being, a topologically complex and dynamically differentiating, iteratively reconfiguring materialization of here-there's-now-then's-being-becomings, an infinity of possibilities condensed into Now—every now, *this* thick-Now bursting with radical possibilities for re-membering, re-bodying the world otherwise. These are ghostly matters. "Hauntings … are not mere subjective rememberings of a past (assumed to be) left behind (in actuality), but rather, hauntings are the ontological re-memberings, a dynamism of ontological indeterminacy of time-being in its materiality" (Barad 2019, 539).

The climax of Hayashi's novella is the narrator's trip to Trinity Site, the place where the first plutonium bomb was detonated on July 16, 1945, at 5:29 a.m. It is here, at the end of her journey, the very place where it all began, standing in the midst of a desert, inside a fenced area with nothing inside it save a monument to nothingness—to Ground Zero—that the fullness of these embodied tracings of all the various colonizing entanglements comes full circle.

> … Trinity is the starting point of my August 9. It is also the final destination of *hibakusha*. From Trinity to Trinity—.
> If I make that journey, I can hold August 9 within my life circle. If I can never be free from the event, I should end my relationship by swallowing it (Hayashi 2010, 11).

What does it mean to swallow an event? Perhaps this is an evocation of the ouroboros, the mythical symbol of the serpent biting its tail, representing 'creation out of destruction, Life out of Death'. Or perhaps it means to ingest the event like radiation: to take it into your gut, to feel it leach into your bones, mutate your innards, and reset your cellular clocks. Perhaps it is about the im/possibility of metabolizing the trauma, transforming the self from victim to survivor. Perhaps it is a way of un/doing the self, of touching oneself through touching all others, taking in multitudes of Others that make up the very matter of one's being in order to materially transform the self and one's material sense of self. Perhaps it is about the willingness to put oneself at risk, to place one's body on this wounded land, to be in touch with it, to have a felt sense of its textures, to come to terms with a shared sense of vulnerability and invisibility, to feel the ways that this land — the colonizer's "void", which marks their continuing practices of a-void-ance — always already inhabits the core, the nucleus of your being (Barad 2017b).

Even the smallest bits of space/time/mattering are an enormous multitude. Each 'individual' — each body of matter you hold in your hand — is made up of entanglements — material relations of response-ability — sedimented histories of intra-actions with 'itself' and all 'others' across spaces and times. On my agential realist account, there is no such thing as a discrete individual with its own roster of properties. In fact, the 'other' — the constitutively excluded — is always already with-in: the very notion of the 'self' is a troubling of the interior/exterior distinction. Matter in its essence — *and this is precisely what is being called into question*, or rather, is the very question it keeps asking itself — is *an ongoing enactment of the undoing of individuality, self, other, identity, property, and kind,* the very stuff that makes up entanglements of colonialism, capitalism, racism, and other forces of violence. Matter itself is constitutively inhabited by a deconstructive force. Not a destructive force that blows itself apart, but rather an energetics that entails the undoing of notions that have been sedimented into Western philosophy and physics (Barad 2017b).

A decolonizing practice of doing physics cannot entail grabbing hold of Western inventiveness to create something new while leaving the sedimented histories and futures of violence unaddressed. On the contrary, in my agential realist account of QFT, the past is not over, and the future is not what will simply unfold, and practices of knowing and being are not separable, so that objectivity is not about distancing, but on the contrary, it is a matter of being in touch, of being in reciprocal relation, a matter of response-ability. This new-old storied-material scientific account contains within its core not a destructive force to be unleashed, but a seed that

holds within it a material force of justice, and the possibilities for living and dying otherwise.

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Gabriele Schwab

Nuclear Temporalities

Abstract: The invention and unleashing of the first atomic weapons generated a historical rupture in the order of things that irrevocably changed the ways in which humans inhabit the world and experience time. The haunting knowledge of the power of nuclear weapons to potentially annihilate planetary life leaves a profound mark on human temporality and psychic life and creates transgenerational nuclear trauma. One of its effects is a subliminal, if not unconscious haunting from the future that overshadows human temporalities. Apart from this haunting from the future, nuclear temporalities also extend to sites of slow or structural nuclear violence. In my contribution, I will trace the entanglement between nuclear temporalities and nuclear subjectivities, including reflection on scale, deep time, nuclear half-life, temporal necropolitics, and psychic toxicity.

Keywords: Hiroshima; temporal scale; haunting from the future; apocalyptic imaginary; transgenerational nuclear trauma

Nuclear Temporalities[1]

1. Time, Scale, and the Apocalyptic Imaginary

However much we didn't want to, however little we would do about it, we'd understood:
we were going to perish of all this, if not now, then soon, if not soon, then someday.
Someday, some final generation, hysterically aswarm beneath an Atmosphere as unrelenting as rock,
would rue us all, anathematize our earthly comforts, curse our surfeits and submissions.

C. K. Williams, *Tar* (1995, 94)

The passage from C. K. William's *Tar* quoted above portrays a haunting that comes from the future of nuclear destruction. It invokes the desire not to know or act, yet insists on the understanding that someday "some final generation" will perish from the forces unleashed with the splitting of the atom and the inauguration of the nuclear age.

The reference to "some final generation" positions William's poem within the framework of nuclear temporalities. The very invention and use of the first atomic bomb and the knowledge of its power potentially to annihilate planetary life have generated a rupture in the temporal order of things that leaves a profound mark on the lived experience of time.[2] We could argue that after 1945, time has never been the same. This shift amounts to a new epistemic configuration that changes the very notion of human temporality.

Whether they are aware of it or not, most people are haunted by the fear of a future nuclear attack. According to polls, until the late eighties, half of all Americans expected to die in a nuclear war during their lifetime. Even when the country tries to mitigate this sense of doom with various defense mechanisms, such as, for example, the manic defense of omnipotent posturing, the marketing of 'Atoms for Peace,' or the silencing of public and media debates, the fear continues to live within the political unconscious. Moreover, the persistent collective forgetting of the nuclear threat in the media, especially after the Fall of the Soviet Union and the end of the Cold War, only heightens the actual threat. In his seminal study on forgetting in the digital age, Andrew Hoskins analyzes three instances when the public media have "forgotten" the nuclear threat. The first time was after the bombing of Hiroshima and Nagasaki, the second after the

1 In this essay, I am including specific edited and expanded sections from different chapters of my book 2020 book: *Radioactive* Ghosts Minneapolis: University of Minnesota Press. While *Radioactive Ghosts* has a much broader range and does not focus on nuclear temporalities, I am systematizing and expanding thoughts on the topic developed in the book.

2 I'm using this in the Foucauldian sense of an epistemological configuration. See Foucault, Michel. 2005. *The Order of Things: An Archaeology of the Human Sciences*. New York: Routledge.

Cuban Missile Crisis, and the third after the Fall of the Soviet Union. Tracing the steep decline in the term "nuclear war" in public discourse after 1989, and especially in the opening years of the 21st century, Hoskins points to the dangerous complacency of this erasure, insisting that "the removal of a widespread perception of the threat of nuclear war actually makes that war more likely" (2018, 63).

After the onset of the Russian war with Ukraine, however, nuclear energy and even the danger of nuclear war have again been making headlines in the news. While awareness of the persistence of the nuclear threat has thus resurfaced, robust debates remain isolated and are far from proportional to the actual threat. Moreover, against all research that demonstrates the opposite, nuclear energy is once again being marketed as a safe, if not green energy.[3] Especially in European countries that have been overly dependent on Russian gas, the use of nuclear energy is seen as an alternative and support is growing, even in Germany, a country that had been at the forefront of anti-nuclear energy politics. The debate concerns the so-called *Laufzeitverlängerung*, that is, an extension on the 2022 moratorium on nuclear power plants. Many fear that an agreement on the extension beyond 2022 could be used by proponents of nuclear energy to undermine the moratorium altogether and re-legitimize nuclear power. At the same time, many experts, including employees at energy companies and corporations, doubt the very feasibility of this nuclear option (see among others Balser and Glas 2022, 6).

At the psychological level, the acceptance of nuclear energy will, of course, require a considerable amount of denial of the risks involved and a splitting from, if not forgetting of the debates and related fears that arose after Chernobyl and Fukushima. People may and indeed have become almost perfect at developing defensive mechanisms against nuclear fears such as splitting and denial, but these mechanisms merely relegate the fears to the unconscious. Psychoanalytic theories from Melanie Klein (1975) to Robert Meister (2011) have analyzed splitting as an ambivalent adaptive mechanism, designed to ward off overwhelming fear or trauma. On the one hand, it is clear that without adaptive splitting and a certain degree of psychic numbing, people will no longer be able to carve out a life for themselves, have children, engage in creative work, or experience a sense of a functional everyday life. Splitting has become the prime adaptive defense mechanism that allows people to live in a mode of 'as if' by ignoring the nuclear threat. However, living one's life as if this threat didn't exist comes with the cost of undermining awareness, resistance and political action and thus increases the risk. Moreover, isolating the threat as a partially unconscious element of psychic life, splitting also diminishes the

3 For a more detailed discussion that refutes this claim, see *Radioactive Ghosts*, 9–14 and 125–127.

relational aspect of nuclear fears and their translation into collectively shared cultural awareness and action. Finally, according to Melanie Klein (1975), splitting is a primitive defense mechanism that operates in a paranoid-schizoid psychic space in which the world is perceived according to a Manichean dualism between good and evil. If widely shared, such a defense can result in a schizoid-paranoid cultural and public sphere.

More generally, under the surface of more tangible fears about everyday subsistence and survival, nuclear fear persists in form of a nameless dread that pervades everything, even if only unconsciously. In the wake of nuclear trauma, climate crises, and generally increasing ecological imbalance, a young generation is beginning to fear the loss of a viable future. Fridays for Future, Extinction Rebellion and Letzte Generation (The Last Generation), the highly symbolic names chosen by the most visible global activist groups, indicate that fears for the future overshadow the psychic lives of an entire generation. At the center of their fights is the problem of the finite temporalities generated by ecological crises, the threat of extinction, and the responsibility for future generations. Founded in Germany, the group The Last Generation openly states on their website that they consider the failure of governments, corporations, and individuals to assume this responsibility to be a crime against humanity:

> The Government ignores all warnings. It is still fueling the climate crisis and has brought us to the edge of the abyss.
> We are no longer willing to accept this crime against humanity without resistance.
> [...]
> We are the last generation that can still prevent society from collapsing (Letzte Generation 2023).

The group's name also includes a direct reference to the biblical apocalyptic imaginary, especially the so-called Last Generation Theology, referring to the last generation before the Second Coming of Christ.

The sense of futurelessness and apocalypse also characterizes the stories and moods of an entire range of science fiction and climate fiction. Many highlight the compounding of two looming massive threats to planetary survival—nuclear war and climate change—to convey the sense of an ending and the terror of futurelessness. In *The Ministry for the Future*, his speculative reflection on possible planetary futures, Kim Stanley Robinson describes the accelerating erosion of future options in the mode of science fiction:

> Climate change caused by carbon dioxide and methane released into the atmosphere; [...] rate of extinctions already as high as at any time in Earth's history [...] subsequent to that coming extinction, inevitable famine, dislocation, and war—possibly nuclear war—leading to the destruction of civilization (2022, 293).

Locating this apocalyptic scenario of planetary destruction in the near future that is just a few decades away, Kim Stanley Robinson chooses the genre of hard science fiction, interspersed with short creative non-fiction essays on historical, sociological, and scientific data, to force his readers to look at the abyss of apocalypse from within.

More generally, the confluence of the threats of climate change and nuclearism inevitably mobilizes an apocalyptic imaginary. The very invention and unleashing of the first atomic weapons had already generated a historical rupture in the order of things that irrevocably changed the ways in which humans inhabit the world and experience its temporalities. The knowledge of the annihilating power of nuclear weapons shapes psychic life for generations to come, thus creating a transgenerational nuclear trauma. One of the traumatic effects is a subliminal, if not unconscious haunting from the future that overshadows human temporalities. Moreover, as I describe in more detail in *Radioactive Ghosts*, nuclear temporalities also extend to sites of slow or structural nuclear violence (Schwab 2020). Ultimately, they affect knowledge regimes, epistemologies and the boundaries of imagination and thought. They affect how people feel, shaping everything from psychosocial realities, ways of being in the world, communal lives, and relationalities, to the very boundaries of subjectivity, including conscious and unconscious psychic life.

In *Infrastructures of Apocalypse*, Jessica Hurley (2020) analyzes the futurelessness that is embedded in nuclearism as part of the new national infrastructure that "has determined the flow of resources and risks across the twentieth and twenty-first centuries" (2020, 3). The temporality at the heart of the nuclear imaginary, she argues, is apocalyptic. With reference to the nuclear catastrophe at Fukushima, Hurley states: "Nuclear apocalypse in the present forces upon us the realization that even dismantling the infrastructures of planetary destruction cannot take us back to an unspoiled time or forward into a nonnuclear future; while the infrastructure of nuclear apocalypse may be temporary, the environmental alterations that they produce are effectively permanent" (210). Hurley's argument implies that the temporality of nuclear destruction cannot be confined to the future. It is with us in the here and now, both materially in the form of permanent damages from the nuclear toxicity that will forever

pervade our planet, and in the form of the psychic damages. The latter are created not only by the awareness of nuclear destruction and risk but also by their denial. Hurley speaks of the "graduated levels of harm that nuclear infrastructures produce in the present" and states that "[t]he nuclear mundane is the slow violence of the atomic age" (14).

Tracing the entanglement between nuclear temporalities and nuclear subjectivities, I will now focus on reflections on scale, deep time, nuclear half-life, temporal necropolitics, and psychic toxicity. Slow nuclear temporalities are marked by the material invisibility of the nuclear threat. Akira Lippit argues that the first use of the atomic bomb inaugurates the age of "invisible warfare" (2005, 4). Extending beyond the immediate damage into the distant future, waves of invisible radiation that infiltrate the survivors' bodies continue the warfare for the rest of their lives. But this fallout of nuclear war happens imperceptibly, and often without the victims' knowledge of the damage until it is too late. In addition to its immediate annihilating destruction, the atomic work of death thus continues to operate as a form of slow violence inside the bodies of victims, as such extending into the aftermath of the official end of the war. Only those victims affected at closest range suffer and die from radiation sickness soon after the attack. Many more will die later from cancers, and it is notoriously hard to prove beyond any doubt, except statistically, that excessive radiation is the cause. Moreover, by potentially inflicting genetic damage on subsequent generations of children of victims and their children, this invisible war also operates transgenerationally. While previous wars had left a psychic transgenerational legacy of war trauma, this invisible nuclear warfare is the first that may potentially leave a transgenerational physical legacy of genetic damage in addition to the psychic one.

With its past, present, and future damages, this invisible war as well as the uncontainable psychosocial fallout of nuclear politics more generally, shape the very structures of temporality and subjectivity. They create a haunting from the future for generations to come, if not the rest of planetary time. Since the onset of the nuclear age, people have been haunted by the knowledge of living on a planet where land, water and air suffer from radioactive contamination. They continue to be haunted by the awareness of invisible, yet potentially lethal toxins in their bodies and the bodies of future generations forced to live on toxic lands. This haunting also creates an often-unacknowledged psychic toxicity[4] (see Masco 2006, 236) that becomes firmly anchored in the political unconscious. Nuclear temporalities are thus marked by a double haunting. While the traumatic memory of Hiroshima, Nagasaki, and other nuclear catastrophes such as Chernobyl and Fukushima generate a haunting from the past,

4 The term "psychic toxicity" was coined by Herman Agoyo, Indigenous anti-nuclear activist from New Mexico.

the fear of slow nuclear violence instilled by long-term planetary contamination, dramatic increase of cancers, and transgenerational genetic damage creates a haunting from the future.

This transgenerational haunting is not confined to visions of humans who might die in a future nuclear war. It also includes phantasms of the mutant body generated by the fear of mutant offspring. Reminiscent of the Lacanian phantasms of the fragmented body, phantasms of the mutant body are also a manifestation of the fact that nuclear fears have weakened the boundaries and stability of the self. As an example of slow nuclear violence, Rob Nixon, for example, refers to the children born in the wake of nuclear tests in the Marshall Islands: "well into the 1980s the history of nuclear colonialism, long forgotten by the colonizers, was still delivering into the world 'jellyfish babies'—headless, eyeless, limbless human infants who would live for just a few hours" (2011, 7). More generally, I would describe the psycho-ontological position of major nuclear trauma in terms of a double haunting, one from the past by the spectral ones who have been incinerated in Hiroshima or were born as mutant children, and one from the future by the spectral ones who have not yet arrived but might be born as mutant children or die in a future nuclear war.

Another crucial aspect of nuclear temporalities is the problem of scale. Both nuclear attacks or catastrophes and slow nuclear damage operate at scales that surpass the scope of human imagination and are inaccessible to sensorial experience. This also holds for the perception of (nuclear) time. In *Troubling Time/s and Ecologies of Nothingness*, Karen Barad writes:

> What is the scale of time? When the cascading energies of the nuclei that were split in an atomic bomb explosion live on in the interior and exterior of collective and individual bodies, how can anything like a fixed, singular, and external notion of time retain its relevance or even its meaning? In a flash, bodies near Ground Zero 'become molecular'—nay, particulate, vaporized—while *hibakushas,* in the immediate vicinity and downwind, ingest radioactive isotopes that indefinitely rework body molecules all the while manufacturing future cancers, like little time bombs waiting to go off (2018, 214).

Considering the scale of matter, Barad then adds: "The indeterminacy of space, time, and matter at the core of quantum field theory troubles the scalar distinction between the world of subatomic particles and that of colonialism, war, nuclear physics research, and environmental destruction" (2018, 215). Suggesting a "relational-ontology sensibility to questions

of time, memory, and history" (223), Barad asserts that the nuclear story needs to trace "a journey across spacetime, nation states, species being, and questions of being/nonbeing" (222).

While the large-scale material effects of nuclearism operate on a trans-human, geological timescale, they also affect species being, both in the here and now and long-term. As I argued previously, the long-term effects are transgenerational since the temporal extension of nuclear destruction encompasses damage to biological reproductive capacities and genetic heredity. This means that, beyond killing instantly, or slowly through radiation sickness or cancers, nuclear weapons also threaten long-term survival at the most basic material level, that is, the genetic make-up of organic life. This is where fears about the nuclear impact on species being open to what Barad (2018, 222) calls "questions of being/nonbeing" and ultimately questions of extinction.

In addition, psychic transgenerational effects include a widespread, if often unconscious, nuclear fear linked to the haunting from the future of nuclear necropolitics. In contrast to the transgenerational trauma caused by traditional war where the trauma originates in a past violent history, transgenerational nuclear trauma thus encompasses past, present, and future. People live with the knowledge not only of the threat of future nuclear attacks but also of the devastating effects of nuclear contamination that extend over many generations into the distant future. In pre-nuclear times, once a war was over, survivors knew that they had survived. They could, for example, process the war trauma by propagating visions of 'never again.' While such visions have also been developed in the aftermath of Hiroshima and Nagasaki, nuclear trauma reaches into the future differently. It is not only fears of slow nuclear violence that generate a haunting from the future; it is also the knowledge that the radioactive contamination of the earth is irreversible and the stockpiling of nuclear weapons as well as the production of nuclear waste from nuclear power plants are ticking time bombs. Nuclear destruction is not encapsulated in the threat of a future annihilating attack; it is already in the here and now.

To face such haunting requires people to imagine thinking and communicating across immense scales that extend over millennia. Caring about planetary futures ultimately requires humans to relinquish forms of anthropocentric temporal thinking that focus on conceivable human lifespans. This challenge has profound implications for nuclear temporalities and their contribution to the formation of psychic life. In *Deep Time*, Gregory Benford writes: "Tempocentric notions of 'the human condition' do not survive" (1999, 2). Nuclear waste alone demands, he argues, "that we mark sites for times longer than the age of our civilization" (1999, 2).

To think about the condition of human and planetary life in the nuclear age thus requires the formation of nuclear subjectivities trained to thinking across vast temporal scales.[5] Benford speaks of a chasm between the deep human longing for perpetuity that is ubiquitous across the diverse histories of civilization and the fundamental fear generated by the awareness that human civilization now has the power to annihilate most life on earth. It is a tension, Benford writes, between a longing to "extend across time some lasting shadow of the present" and an "anxiety about the passing of all referents, the loss of meaning" (1999, 3).

Imagining extinction thus becomes of utmost political urgency. The haunting from the future of anticipated nuclear annihilation can only be ignored by a denial operating in collusion with the epistemology of (self)-deception that marks nuclear politics. The challenge then is to imagine possible forms of extinction without succumbing to the sensational or fetishizing lures of an apocalyptic imaginary. The latter looms large in the formation of nuclear subjectivities but remains confined to a paranoid-schizoid world. While apocalyptic phantasms propel a return of denied or repressed nuclear fears, these phantasms often come in the domesticated form of either illusory survival or of melancholic attachments to omnipotent visions of extinction. Both are fueled by the autoimmune logic of the death-drive that finds it ultimate satisfaction in species-suicide.

On the other hand, and in sharp contrast to apocalyptic phantasms of nuclear destruction, we find the politics of splitting and denial, often tied to a psychologically inevitable widespread disaster fatigue, if not disaster amnesia. How then can we negotiate the deep ambivalence that haunts apocalyptic visions as well as disaster fatigue? Imagining extinction will inevitably mobilize the arsenal of the apocalyptic imaginary that is intimately tied to nuclear temporalities. Insisting on the centrality of facing apocalypticism and "the continuing importance of apocalypse to disrupt conservative realisms," Jessica Hurley (2020, 34) distinguishes between two competing apocalyptic temporalities and modes, ending and revelation. "What if 'the insecurities of [the] now' demand that we take apocalypse more seriously?" she asks and asserts, against the devaluing of apocalypse in contemporary theory, that strategic radical apocalypticism "produces valuable forms of work, thought, solidarity, and care" (37f.).

In this respect, the apocalyptic imaginary may become a productive response to the sense of futurelessness discussed earlier. Hurley (2020, 223) concludes *Infrastructures of Apocalypse* with an emphatic statement about living in a futureless nuclear temporality: "Apocalypse as radical afuturity casts us into a present without ends," she writes, but only to qualify her point with a quote from Jean-Luc Nancy: "not an immo-

5 Among other things, it is the technology of "radioactive dating" that has helped scientists to enhance such scalar imaginings.

bile present but a present within historical mobility, a living sense of each moment, each life, each *hic et nunc* [here and now]" (Hurley 2020, 223; Nancy 2015, 59). Nancy's insistence on historical mobility within the sense of futurelessness thus counters the threat of disaster fatigue, if not psychic paralysis generated by the fear of nuclear annihilation. Even more emphatically, Hurley concludes with a statement that opens a vision of living in the ruins of nuclear infrastructures and its temporalities: "apocalypse is where we must reside, with futurelessness affording the chance to keep the present open to radical change just a little longer, suspended between the unbearable past and the impossible future, here, at the end of the world" (2020, 35).

2. The Hiroshima Shadow Image

One globally circulated image "Human Shadow Etched in Stone" taken by Yoshito Matsushige perfectly embodies the specter of nuclear annihilation, namely the imprint of a human incinerated by the atomic bomb on the steps of a Hiroshima bank. While this imprint freezes the human forever in the immobility of a petrified image, countless poets, writers, and cultural critics have mobilized this image, bringing it back to life in poetic or philosophical reflection.

The imprint of this ghostly human shadow left by thermal rays on stone has proliferated in representations of the atomic attacks, including an entire range of poetry. I argue that it serves as a transformational cultural object shared worldwide for the processing of nuclear trauma. As the continuing history of its reception in the cultural imaginary demonstrates, the Hiroshima shadow image is haunting in its very iconic value. This trace of a human incinerated and burnt into stone has become a chronotope that spatially embodies nuclear temporality and turns viewers into mute witnesses of the shadow left by atomic annihilation. "Burning, another world enters through the shadows of bodies flashed on walls," (1994, 273) writes Linda Hogan in her poem *Prayer for Men and Children*. The 'other world' that enters through these shadow images is the beginning of the nuclear age. Evoked by the past trauma of an individual life that was annihilated by the first atomic bomb, this other world also mobilizes the knowledge of a possible future annihilation, a world of "bodies flashed on walls" that herald extinction of life and time. It is the latter that causes the permanent trauma of a hitherto unknown anticipatory haunting from the future.

The Hiroshima shadow image offers the perennial trace of a man's life as it was snatched away from him in a second, consumed by a murderous nuclear force whose radiation left nothing but a stain on the stair, icon and chronotope of atomic death. And yet, as another powerful poetic image from the poem *Shadow* by Stephanie Strickland reminds us, the stain erases the individual human in the very moment that monumentalizes his trace:

> The monument:
> a grey stain fused
> in concrete, a shadow
> cast on three steps in Nagasaki
> for a moment, by the silvery flash
> of the explosion;
> etched there by light
> from the suns
> that exposed it. Not a man
> Not a woman. An effigy: human
> by deduction,
> like a cloak (1994, 209).

Perhaps it is the very erasure of the human, its presence by mere deduction that turns this shadow image into a prime icon of the first atomic attacks that inaugurated the age of nuclear temporalities. As an empty graph, the image extends an invitation to viewers to project the affects that fuel their nuclear imaginary. Yet Strickland adds an important notion to the reception of the shadow image. Her poem likens the shadowgraph to an effigy, that is, a model of a particular person originally designed to be damaged or destroyed in protest or expression of anger. The image of the effigy has the capacity to invoke both, a haunting from the past nuclear attack that was, after all, conducted as an act of retaliation for Pearl Harbor, and a haunting from the future of an all-out nuclear annihilation that leaves nothing behind but a timeless shadow world of incinerated humans.

As I suggested earlier, it is this haunting from the future that distinguishes the temporality of nuclear trauma from that of other forms of trauma. In *Climate Trauma,* E. Ann Kaplan (2016) presents a reading of Michael Madsen's *Into Eternity* (2010), a documentary about nuclear waste. Kaplan proposes the concept of "pre-trauma" to address what I have been calling haunting from the future. Kaplan describes the film's dark mood in terms of a "pretraumatic scenario, a trauma waiting to happen" (2016, 120).

While Kaplan's concept of "pre-trauma" bears certain affinities with my concept of "haunting from the future," the main difference between the two concepts lies in two divergent notions of nuclear temporality. While Kaplan's term "pretrauma" suggests a time before trauma, I insist that a "haunting from the future" already generates trauma in the here and now. In alignment with Hurley's concept of nuclear infrastructures, we could argue that the life worlds we inhabit in the nuclear age are causing traumatic effects at the infrastructural level.

I agree with Kaplan's suggestion that *Into Eternity* positions viewers as witnesses to a catastrophe in an unfathomably distant future. But in addition, I argue, the documentary also invites us to engage in an experimental apprehension of a temporal scale that is almost impossible to imagine. Ultimately, I am reading Madsen's film as a cinematic reflection on nuclear temporality. It was the fascination with this problem of temporal scale, Madsen says, that motivated him to make *Into Eternity*. Thinking about the problem of the immense temporal scale of 100,000 years opened by the film, we could in fact argue that, apart from the irresolvable problem of toxic waste, it is temporal scale itself that haunts the film as well as its viewers. "How far into the future will your way of life have consequences?" (Kaplan, 2016, 123) Madsen, as the film's narrator, asks. This haunting by scale thus also bears upon the responsibilities humans today assume when they leave a deadly crypt of nuclear waste for future generations.

According to Kaplan, the viewer is put in the position of "the ghost-like human" (121) who is the film's imaginary addressee. And it is indeed this spectral addressee that haunts viewers of *Into Eternity* from a distance of 100,000 years. Madsen also anchors the scale of this haunting in the sheer unlimited capacity of radioactive substances to cause damage. He defines atomic light as "a fire that cannot be extinguished" because it has already penetrated everything, soil, crops and bodies, human or animal. Of course, the image of a fire that cannot be extinguished also resonates with the Christian vision of hell as a fire that burns for eternity. And, if one assumes that this catastrophic "eternal fire" has already irreversibly damaged the human gene pool (along with that of other species), the film's imaginary addressee is literally a radioactive human ghost.

But how does one alert a ghostly being who is supposed to discover the site 100,000 years from now about the dangers of the nuclear waste repository? We recall that Gregory Benford argued that the problem of nuclear waste demands "that we mark sites for times longer than the age of our civilization" (1999, 2). The scientists and philosophers Madsen interviews presume that in 100,000 years from now, the evolution of languages will have made current languages incomprehensible. Hence, they debate

whether it might be better to leave the site completely unmarked or to try to imagine iconic markers that will remain readable and translatable across millennia. Among these are, for example, surrounding the site with a threatening wall of thorns and rocks. But they also think of cartoonlike warnings, and, at someone's suggestion, a copy of the universally terrifying painting by Norwegian artist Edvard Munch's *The Scream* (see Kaplan 2016, 124). Yet, all these ideas to use warning signs about the danger of radioactive materials are, of course, based on the remarkable hope not only that the human species does survive the next 100,000 years, but also that present-day humans are indeed capable of such a transgenerational, and possibly trans-millennial, iconic communication between ghosts that would save their distant descendants from the lethal danger they have left them as their haunting legacy.

The Hiroshima shadow image and Madsen's *Into Eternity* have become icons in the nuclear imaginary that confront viewers in different ways with the specter of extinction. Both images aim at disrupting the numbing and trauma fatigue that are prominent psychic manifestations of nuclear temporalities. In *Indefensible Weapons*, Robert J. Lifton and Kai Erikson (1982) explore this pervasive psychic numbing as a defining feature of nuclear subjectivities. At the end, they pose the haunting question "[W]ould the survivors [of a nuclear holocaust] envy the dead?" to which they give the following answer: "No, they would be incapable of such feelings. They would not so much envy as, inwardly and outwardly, resemble the dead" (1982, 278). This assumption alerts one to the fact that extinction needs to be thought of not only in terms of what Derrida (1984, 24) calls the "remainderless destruction" of an all-out nuclear war, but also in terms of what Lifton (1991) calls "death in life," that is, the psychic condition in which massive trauma has literally extinguished the capacity to feel. Lifton's interviews reveal that, in the immediate aftermath of a nuclear attack, psychic numbing is a protection against the terror of mass death. Someone unable to feel alive does not need to fear death. However, survivors continue to live a form of death in life.

As the term suggests, death in life is the manifestation of a paradoxical psychic temporality. Death is supposed to happen in the future after the end of life. Under exceptionally traumatic circumstances, however, psychic death can happen in the middle of life while the body still lives on. This paradoxical experience of temporality unfolds within the differential space between corporeal and psychic life. In the case of the paradoxical nuclear temporalities experienced by victims of atomic attacks, death in life is also a concrete manifestation of futurelessness. There is no sense of a future life because death has already happened prematurely. Past,

present and future are enfolded in the here and now of death in life as the most extreme form of psychic numbing.

It is important to note that Lifton analyses psychic numbing not only in victims but also in perpetrators of nuclear attacks:

> [P]atterns of psychic numbing have surrounded the overall creation, testing, and military use (actual or planned) of nuclear weapons: a combination of technical-professional focus and perceived ideological imperative which excludes emotional perceptions of what these weapons do. It is no exaggeration to say that psychic numbing is one of the great problems of our age (1991, 508).

According to Lifton, psychic numbing and death-in-life thus occur as an isomorphic psychic damage that affects both victims and perpetrators, albeit in different ways and to a different degree. Survivors live a paradoxical life in which death is no longer awaited in the future but has prematurely, if not permanently arrived in the present. Perpetrators have deadened their world by killing the emotions they would experience if they fully faced the destructive forces they have unleashed by using atomic weapons.

Beyond the distinction between corporeal and psychic death, there is, however, another distinction that needs to be considered in theorizing nuclear temporalities. It is death by extinction. In *The Fate of the Earth*, Jonathan Schell contends that nuclear temporalities have enhanced the power of death on earth by introducing what he calls "the second death" (2000). Schell distinguishes two forms of death, namely the natural death of an individual and the death of a species by extinction. For humans—the species responsible for creating the conditions that propel extinction—this second death entails facing the death of mankind (2000, 115). Schell concludes that in the event of a nuclear holocaust the two forms of death merge and the distinction collapses:

> In extinction by nuclear arms, the death of the species and the death of all the people in the world would happen together, but it is important to make a clear distinction between the two losses; otherwise, the mind, overwhelmed by the thought of the deaths of the billions of living people, might stagger back without realizing that behind this already ungraspable loss there lies the separate loss of the future generation (2000, 115).

Nuclear necropolitics thus performs a double work of death, namely killing on a massive scale with the most lethal weapon of mass destruction and the potential extinction of the species. In short, nuclear necropolitics doubles the work of death with the work of extinction. As Schell writes, highlighting the paradox at the heart of nuclear temporalities: "Death is only death; extinction is the death of death" (2000, 119).

Interestingly, however, because of this very threat of extinction, nuclear temporalities have also simultaneously introduced an enhanced concern with the survival of the species. In his interviews with survivors of Hiroshima and Nagasaki, R. J. Lifton reports that, after the attacks, many survivors for the first time thought of themselves in terms of belonging to the human species rather than to a nationality, city or even family. To account for this new formation of subjectivity, Lifton coined the term "species self." He defines the latter as the recognition of "our *shared fate* as fellow members of a single species in trouble [...] a sense of being part of humankind" (Lifton and Mitchell 1996, 355). In *Radioactive Ghosts*, I propose an expansion of the concept of species self, contending that in light of the confluence of nuclearism and other cataclysmic ecological catastrophes that threaten planetary life, we need to develop the more encompassing notion of a "transspecies self" (Schwab 2020, 237f.). The latter is based on an ethics of concern, responsibility and care for other species with whom we share the planet. Concomitantly, what Schell calls the "second death" needs to include the extinction of other species as well.

In the words of Hiroshima survivors interviewed by Lifton, the kind of death faced by victims of nuclear attacks is also a "false death" (1991, 309). The latter emerges from the feeling that, in a world whose entire order has been shaken by the introduction of nuclear weapons, the unprecedented possibility of total annihilation leaves the notion of natural death behind. Along with the sense of a natural lifetime, nuclear temporality, in other words, also preempts the notion of a natural death. If Lifton calls this a "false death" or "double death," it is because an entirely unnatural psychic death happens before the actual death of the body. This false death will henceforth haunt the survivors of nuclear attacks from within like an uncanny double of natural death. They continue living the life of ghosts, almost as if outside of time, revenants from a wrongful death that has already happened. Their world has become a nuclear crypt.

In *Hiroshima in America,* R. J. Lifton and Greg Mitchell (1996) argue that the nuclear phantasms of an "apocalyptic self" that are related to death and immortality are supported by this psychic mechanism of "doubling." While people are usually trying to make their way through the natural life cycle in measured ways, Lifton and Mitchell argue, certain traumatic

events or psychic states reactivate the "apocalyptic self" that is preoccupied with premature or violent death, such as death through catastrophic illnesses, mass killings, genocide, or nuclear Holocaust. Lifton and Mitchell consider a doubling of the self in form of a division between a "measured self" and an "apocalyptic self" to be a ubiquitous psychological trait developed to cope with the knowledge of mortality. All ecologies of fear, we can surmise, mobilize phantasms of the apocalyptic self. We have seen, for example, that the inauguration of the nuclear age with Hiroshima and the ensuing arms race during the Cold War have forever disrupted the expectation of a natural life cycle and therefore released the dangerous energies of the apocalyptic self. In a ubiquitous ecology of nuclear fear, the apocalyptic self becomes part of the cultural imaginary. Everything depends, then, on how the dynamic between the measured and the apocalyptic self is negotiated, or, to put it differently, whether apocalyptic visions are used defensively or as a tool of confronting nuclear fears.

Psychologically, the apocalyptic self and death-in-life are complementary psychic manifestations of nuclear temporality. While the apocalyptic self is obsessed with visions of premature death and catastrophic annihilation, "death-in-life" is the psychic condition resulting from the numbing of the very fears that haunt the apocalyptic self. If the paralyzing condition of death does not occur at the very end of a lifetime because psychic death has already happened in the here and now, the curtailing of emotions to a manageable scale comes in the form of an injurious psychic splitting and collective denial. It is a schizoid splitting that creates an internal crypt which houses the shadow lives of foreclosed futures. As the crypt is removed from lived time, the shadow lives of radioactive ghosts act like a poison from inside. Herman Agoyo, the Indigenous activist from the nuclear borderlands, identified such a condition as "psychic toxicity" (2006, 30). In *Death in Life*, Lifton vividly describes such toxicity of the mind in the case of a Hiroshima survivor: "The embittered world-view becomes his total vision of the way things were and the way things are. Not having been able to 'vomit' his 'bitter water,' such a survivor finds his entire psychic life poisoned by it" (1991, 526).

In *The Shell and the Kernel* (1994), Abraham and Torok envision a crypt in which people bury unspeakable events or unbearable, if not disavowed, losses or injuries incurred during violent histories. In the twentieth century, Auschwitz and Hiroshima are the names that designate such unspeakable histories of violence. The "nuclear crypt" (see Schwab 2010) manifests as a collective psychic operation designed to ward off, if not deny the toxic legacies of nuclearism. It forms a space of haunting, a haunting that comes from both the past and the future, the outside world and psychic

life. Nuclear trauma resists integration into the psychic fabric. According to Abraham and Torok, any form of unnatural death creates ghosts that come to haunt the living. The legacy of nuclear violence haunts not only its actual victims but, knowingly or unknowingly, everyone on the planet, including future generations.

Both Auschwitz and Hiroshima also stand for the first instances of technologically induced mass extermination. "In the extermination camps natural death was completely eliminated," writes Günther Anders (1956, 148) and concludes that, as a consequence, "all men are exterminable." The crucial step from Auschwitz to Hiroshima, he argues, lies in the fact that "what is exterminable today is not 'merely' all men, but mankind as a whole" (1956, 148). And, we should add, most other living species as well. It is this shift toward extermination that inaugurates the nuclear age and the vicissitudes of nuclear temporality.

The confluence of the complete elimination of natural death in Auschwitz and the fear of nuclear annihilation, a man-made unnatural event, create a collective haunting from both past and future. Formed in response to a refusal or inability to mourn the pre-nuclear world and the victims of nuclear violence, nuclear crypts harbor radioactive ghosts like undead vibrant matter (see Bennett 2010). Just like the material half-life of radioactive matter, the psychic half-life of nuclear trauma approximates notions of an immortal force in the perennial here and now of nuclear temporality.

Nuclear temporality is thus also predicated on the loss of a pre-nuclear world that provided humans with a sense of permanence and transgenerational continuity. Yet, while we may disavow the loss of such a world, we keep its memory psychically alive, if only unconsciously. In *Thermonuclear Monarchy*, Elaine Scarry argues that U.S. citizens have been disempowered for the last sixty years, becoming like the global population more generally, "frozen in structures of thermonuclear subjugation" (2016, 22). We may add to Scarry's observation that this subjugation also operates in the nuclear unconscious through the capture by the nuclear in a mode of repression. We could indeed speak of a nuclear colonization of the mind.[6] Generating a particular form of transgenerational nuclear trauma, this colonization extends into the future. The unconscious however, as Freud insists, knows no time. The nuclear crypt and the nuclear unconscious more generally therefore hold us psychically captive in the dead time of a frozen here and now. This freezing of time is another form of death in life, a temporal one that cuts into the flow of lived history.

This is yet another instance of futurelessness. We might envision the *Angelus Novus* of our time, the Angel of Nuclear History, staring at, yet

6 Moreover, the nuclear state of exception and the subjugation that Scarry notes extend beyond the parameters of nuclear weapons and war to include the nuclear energy empire that generates radioactive contamination of the environment, ozone depletion, and the unmanageable proliferation of nuclear waste. In response to the growing global resistance, nuclear energy industries have developed a widespread politics of cover-up, deceit, and outright lies.

moving away from, the world's nuclear contamination, his face turned toward the past. Does he, as Benjamin suggests, see one single catastrophe, which keeps piling wreckage upon wreckage and hurls it in front of his feet? Would the angel like to awaken the dead, and make whole what has been smashed? And is it a nuclear storm that is blowing from Paradise, getting caught in his wings with such violence that he can no longer close them? Benjamin (1968, 258) writes: "The storm irresistibly propels him into the future to which his back is turned, while the pile of debris before him grows skyward." Can we find a better image for the skyward-growing pile of radioactive waste and the nuclear storm that pushes life toward extinction?

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Co-Conjuration: Practicing Decolonial Nuclear Criticisms

Abstract: The article explores decolonial nuclear criticisms in transpacific contexts. It focuses on different cultural productions—film, play, ethnography, historical narrative, and literary criticism—to consider what I call cultural practices of co-conjuration. Co-conjuring practices in some of the texts I explore alert us to the entangled relations between apparently distinct nuclear catastrophes—for example, among radiogenic harm suffered by Indigenous communities, the wartime use of atom bombs, and the meltdown of nuclear reactors. By calling forth ghosts, memories, affects, and a sense of justice associated with nuclear-specific loss and pain in the *longue durée* of colonialism, militarized empires, extractive settler capitalism, and environmental crises, co-conjuring has the potential to produce relational sensibilities that can move us beyond the colonial partitioning of nuclear knowledge. The paper furthermore considers what must be wagered when we attempt to produce relational knowledge by connecting incommensurable histories and experiences across disparate times and spaces.

Keywords: Decolonial Justice; Nuclear Universalism; Relationality; Hauntology; The Sahtu Dene of Great Bear Lake; Hiroshima; Fukushima

Catastrophes...connect with the totality of interdependences that make up general equivalence....it is this equivalence that is catastrophic. —Jean Luc Nancy, *After Fukushima* (2015, 6)

Shortly after the declaration of nuclear emergency following the earthquake and tsunami that hit northeastern Japan on March 11, 2011, American historian Peter Kuznick published an online essay entitled, "Japan's Nuclear History in Perspective: Eisenhower and Atoms for War and Peace". Kuznick (2011) cited the following passage from a *Washington Post* editorial published in 1954:

> Many Americans are now aware … that the dropping of the atomic bombs on Japan was not necessary … How better to make a contribution to amends than by offering Japan the means for the peaceful utilization of atomic energy. How better, indeed, to dispel the impression in Asia that the United States regards Orientals merely as nuclear cannon fodder!

The editorial was part of President Eisenhower's public relations initiative known as the 'Atoms for Peace' campaign. The campaign aimed to contain the fierce grass-roots antinuclear movement that swept through Japan in the same year a Japanese tuna finishing boat, Lucky Dragon No. 5, was exposed to fallout from Castle Bravo, the largest among the sixty-seven nuclear tests the U.S. government conducted over the Marshall Islands during the period from 1946 to 1958.

Commonly known as the Bikini Incident, twenty-three Japanese crew members were exposed to the fallout in the vicinity of the Bikini Atolls, and one died after developing acute radiation syndrome. In part due to the worldwide antinuclear movement it triggered, the Lucky Dragon No. 5's plight seems to have gained a relatively secure place in the Global North's metropolitan memory of nuclear catastrophes. For the Marshall Islanders, by contrast, the nuclear bomb test was not a one-time event. The radioactive contamination of the atolls precipitated their forced removal from the indigenous land and sea, followed by unending exile. The devastations brought immediate harm to not only individual bodies, but to their existence and their whole way of life and livelihood (see Teaiwa 1994; Johnston and Barker 2010; Barker 2013). While there are notable exceptions, including Ōishi Matashichi (2011), one of the survivors of the Lucky Dragon No. 5, who long insisted that the 'Bikini Incident' is not a thing of the past for both the Marshall Islanders and himself, Japan's mainstream, nationalized

nuclear perceptions have failed to register the Marshall Islanders' continuing struggles against the nuclear order beyond the Bikini Incident. It is only within the recent decade that awareness about the acceleration of climate change and the threat of a breach and leak of the Runit Dome nuclear waste site in the Enewetak Atoll (Horowitz 2011; Jetñil-Kijiner 2017) has forced international publics to wonder if the radioactive hazards may no longer be containable to this space of nuclear colonialism.[1]

The *Washington Post* editorial Kuznick called forth from nearly six decades earlier suggested the remarkable transvaluation initiated by the 'Atoms for Peace' campaign. In effect, the campaign shifted the new technology's meaning from that which is associated with death and annihilation to a biopolitical one that promotes life, progress, and well-being. Through the clandestine collaboration between U.S. foreign intelligence and conservative Japanese media-corporate oligarchs and politicians—such as Shōriki Matsutarō whom U.S. authorities had saved from being indicted as an A-class war criminal—the 'Atoms for Peace' campaign successfully introduced U.S. nuclear power to postwar Japan. It was through this post-WWII, cold war transpacific management that General Electric built Fukushima Daiichi Plant's 'Mark 1' reactor. By the time the earthquake and tsunami triggered the meltdown in 2011, a total of fifty-four nuclear reactors were in operation in Japan, supplying approximately 30% of the country's electric power (Shushō 2011).

I opened my exploration of decolonial nuclear criticisms with Kuznick's intervention in the post-3.11 discursive space because it puts into sharpest relief the perniciousness of disconnected knowledge. Kuznick's essay clarified that the United States was fully aware of the geopolitical importance of Japan and, through the trope of reparation, mobilized the nation for the eventual success of the American nuclear military-academic-industry (Yoneyama 2016). But more importantly for this study, the midcentury episode Kuznick invoked in the post-3.11 discursive sphere highlighted the ways in which the links between Fukushima and Hiroshima had been disavowed in US-centered metropolitan nuclear perceptions. Of course, for many antinuclear activists, the connections between Hiroshima and Fukushima—and indeed many other sites of nuclear injuries including the Marshall Islands—could not have been more transparent. Yet for many others, the two time-spaces have been treated as if they are separable, each entailing disparate contexts and different utilities, such that their cross-referentiality for science, medical research, and policies is deemed questionable (Takahashi 2012). In other words, "Japan's Nuclear History in Perspective" brought together Hiroshima 1945 with Fukushima 2011 to illuminate the connection between the thermonuclear technology's war-

1 Danielle Endres (2008) on "nuclear colonialism." Laduke and Churchill (1985) on "radioactive colonization."

time use for weapons of mass destruction and its peacetime use for clean energy.

One of the key interventions in recent transnational American studies on race, empire, and colonialism has been the relational-comparative turn. Pointing to the limits of analogical thinking in the conventional comparative framework and the way it has produced false equivalences, the relational-comparative methodology (that is, epistemology and theory) has allowed many scholars to question geohistorical categories and processes not in isolation from each other but as entangled and produced relationally. Manu Vimalassery, Juliana Hu Pegues, and Alyosha Goldstein (2016), among others, have charted the problem of "colonial unknowing" and its underlying "analytic tendencies that foreclose or bracket out interconnections and relational possibilities" (3). This insight is especially important to my study. By suppressing relational analytics "colonial unknowing" or "colonial agnosia" has helped sustain colonial-modern knowledge formations. Likewise, framing the existing transnational nuclear order as a problem of knowledge, I hope to identify decolonial nuclear criticisms in those cultural practices that perceive and represent nuclear catastrophes at different geohistorical locations as entangled and produced inter-connectively. Such framing should direct our attention to the ways in which the nuclear world we live in is made known and not known to us. It calls forth critical reflections on the certitude with which we claim to know nuclear things and beings, such that we might begin to wonder about other epistemologies and other ontologies that are, in fact, closely entangled with our own. I contend that this repression of connectivity, or in the words of the three American studies scholars, the "preempting of relational modes of analysis" (1), is what helps sustain the colonial-modern order of which nuclearism is an integral part.

Extending Jacques Derrida's hauntology, sociologist Avery F. Gordon (2008) famously deployed the idea of spectrality in critiquing what she called "the retrieval enterprise" of social sciences and positivist knowledge. Ghosts and specters, according to Gordon, not only remind us of the instability, uncertainty, and imperfection of evidential knowledge. Underscoring the concerns for social transformation in the works of Luisa Valenzuela and Toni Morrison, Gordon concludes: "The ghostly phantom objects and subjects of modernity have a determining agency on the ones they are haunting" (201). Unlike those of continental deconstructionist and poststructuralists who have likewise engaged Derrida's concept of haunting, Gordon's ghosts are traces of ongoing material violence. They point to the immanence of colonial erasure, the unspeakability of liberal-inclusionary racism, and civilizational extermination that endure

even in disavowal. This spectrality, the haunting presence of the unknown absence, can prompt questions regarding how our knowledges might be disciplined and regulated according to conventional periodization, familiar geographies, and disciplinary boundaries; the problem akin to the "colonial unknowing" mentioned above.

It is with these insights in mind that I opened this paper with Kuznick's essay to offer his narrative as an instance of "co-conjuration." Co-conjuration, I submit, is a way of summoning, across disjointed times and discrepant geographies, those specters that potentially point to the connection and relationality that are elided in the production of nuclear knowledge. By doing so this practice contests the modes of "colonial unknowing" subtending the existing nuclear order. In my view, more than a demonstration of cause and consequence, the historian's narrative critically illuminated the proximities between 'the atoms for life' and 'the atoms for death' — the two nuclear activities mostly invoked as if discretely separable — and how the proximities between the two have had to be repressed and regulated for the maintenance of the transpacific nuclear order. By simultaneously conjuring the two disjointed times and spaces — the 1954 Bikini Incident and the 2011 Fukushima meltdown — the historian's intervention unsettled our commonsense about nuclear arrangements in the post-World War II, cold war transpacific. If there was a ghost haunting the historian's recitation of the 1954 editorial, it was there to mark the disavowal of the entangled connections between war and peace, death-world and life-world, violence and repair.

In the following, I will explore other instances of co-conjuration as cultural practice or the aesthetic strategy of questioning the colonial partitioning of nuclear knowledge. By aesthetics, I do not mean art per se, or the valuation of beauty and judgement in the Kantian sense, but refer to the sense, sensibility, and the experiences thereof, as well as the ways in which these senses are ordered, normalized, and regulated.[2] And by knowledge, I do not delimit it to so-called rational knowledge but include knowledges that are embodied, intuited, even haunting. I will examine cultural productions — literary text, play, historical narrative, ethnography, and literary criticism — that call forth memories, affects, and the ideas of justice concerning nuclear-specific loss and catastrophes as situated within the militarized political economy, old and new empires, and the settler state's extractive capitalism. Co-conjuration can be thought of as an aesthetic strategy that brings together the pained histories, grief, and grievances from dissimilar contexts to illuminate their connections; if even in transience. As such, not unlike Gordon's ghosts who alert us to "a something to be done" (202), the instances of co-conjuration I explore

2 Chuh (2019) on the concept of aesthetics.

below may potentially move us beyond the colonial agnosis that has shaped our knowledge and non-knowledge about the nuclearized world we inhabit. I will discuss, in concrete, *Village of Widows*, a documentary film by the Canadian film maker Peter Blow (1999) and the Metis playwright Marie Clements's *Burning Vision* (2002). Both have inspired robust creative and critical responses in North America over the past two decades. I will consider the two texts alongside the critical responses that have appeared in the forms of autoethnography and literary criticism. I will sift through the salient differences in the ways the interlocutors have perceived the film and the play, together or respectively, to ascertain what must be wagered in the practice of co-conjuration and in what ways it could steer us toward critically relational ways of knowing the nuclear. This paper is an attempt to suggest such methodological considerations toward a decolonial nuclear criticism.

Unfathomable Connections: *Village of Widows*

Peter Blow's documentary film, *Village of Widows*, portrayed the twentieth century history of the Sahtu (Sahtúgot'ine/Great Bear Lake) Dene people in the Northwest Territories and their entanglement with Canada's nuclear complex. From the very outset the film announces that its narrative arc will evolve around the Dene's struggle with the devastation brought on by the settler state's resource extraction. In the interview briefly inserted into the mournful opening scenes of the town of Déline, Shirley Baton recounts: "My dad died of cancer, my aunt died of cancer, my grandmother died of cancer, my mom is suffering because of her sickness and, like what about my children?" (1:10) This personal account of the generations lost to cancer, which is feared to be carried on into the future, is punctuated by another short interview with Cindy Kenny-Gilday,[3] this time underscoring the threat to Dene's collective existence: "Their survival as a society is at question because the young men are floundering. They don't have grandfathers, fathers, uncles to help them face this confusing world. It's a deep wound" (2:20). The film makes explicit that the Indigenous community's suffering relates to the nuclear age at large as the three snapshots of mushroom clouds — presumably of the nuclear explosions at the Trinity test site and the Marshall Islands — appear in a quick sequence behind the film's full title.[4] The voice-over narration that pulls together the interviews and archival film footage informs the viewer that the Dene people's collective suffering has resulted from their association with the mining industry in the region. The sound effects of the Japanese

3 Kenny-Gilday (2000) on the Dene knowledge based on oral history.
4 I thank Brenton Buchanan for transcription of the film and discerning the three images.

string and wind instruments merging with the native drums accentuates the entanglement of the Dene people with Japan.

Since the 1930s, mining activities in the Northwest Territories have relied on the Sahtu Dene people for their labor. The Eldorado Mine that operated in the area did not deploy Dene as miners but mainly to transport pitchblende from the mining site onto the boats docked at the bay. While men worked as carriers, women provided the labor of cleaning up dust and debris from the used and emptied ore sacks. In 1942 the Canadian government nationalized the mining operations in the area, then renamed as Port Radium, under the wartime mandate and exported the uranium for the Manhattan project to develop atomic bombs (Bothwell 1984; van Wyck 2010). The mine at Port Radium was decommissioned in the early 1980s but the community of Déline continued to experience a high-rate of cancer-related deaths among workers and families who had handled and carried the ore. Blow's film captured the Dene's struggle for survival nearly five decades after the end of World War II. During the 1990s the Dene organized themselves to voice their concerns about the prolonged detrimental effects of radioactive wastes in the Lake's vicinities. In 1998 the Déline Dene Band Uranium Committee (Uranium Committee hereafter) issued a report, *They Never Told Us These Things: A Record and Analysis of the Deadly and Continuing Impacts of Radium and Uranium Mining on the Sahtu Dene of Great Bear Lake*, emphasizing that the Dene people who worked at the mine had never been informed of the adverse health effects of radioactivity, nor had they been provided with any protection when handling the contaminated materials. Blow's film briefly introduces the Dene delegation's travel to Ottawa for a meeting with cabinet ministers in which they attempted to address their concerns and presented a fourteen-point action plan included in the report. While Uranium committee member Gina Bayha described the meeting as what "would be a historical moment" (27:51), the film captured constitutive indifference beneath the surface civility of the high officials and the impossible drudgery of facing what Carmella Gray-Cosgrove called "the bureaucratization of Sahtúgot'ine knowledge" (2015, 81). The narration summarized the community's disappointment: "For all the expressions of sympathy in the six months since the Ottawa meeting, there has been very little progress on any of the communities' fourteen points" (32:41).

Summarizing the results of a five-year investigation by the Canadian state, The Canada-Déline Uranium Table (2005) acknowledged that the Dene workers were not properly informed of the radiation hazard (1999–2004). But it denied the risk of radiation-induced cancer and fell short of recommending a full investigation. In 2007 the Canadian government

launched a $7 million remediation effort. Risk assessment reported in 2006 indicated that "the radionuclides present at the Port Radium mine site are not a cause for concern from an ecological perspective" (ix). Henningson's documentary (2007) builds on Blow's film and traces the Dene's subsequent decision to resume mining operations in the aftermath of remediation. While highlighting the predicaments the Indigenous communities must face when choosing their future under the constraints of settler colonialism, the film nevertheless included an interview with the Navajo Nation's leaders on their community's decision to ban uranium mining on Navajo land; thus suggesting the possibility of trans-Indigenous dialogue and solidarity toward another future delinked from the global nuclear order's extractive capitalism.

Village of Widows did not merely represent the Dene community's experiences. Rather, it actively contributed to the Sahtu Dene's efforts to raise public awareness about the settler state's past and ongoing disregard for their lives and existence. Canada-based environmental anthropologist Peter van Wyck extensively commented on the film in his field journal, *The Highway of the Atom*, in which he chronicled the journey of uranium across Canada. Reflecting on how the film and its story were taken up by the national public television and other media, van Wyck summarized the film's far-reaching impact on Canada's national consciousness as follows:

> In a way, until Blow's film was made, there was no story to be told—but through the patient organizing of oral narratives and historical and archival materials, it created a key moment in the retroactive and traumatic re-evaluation and politicization of the past that the Dene were becoming engaged with at the time the film was made (2010, 48).

To be sure, as discussed below, Canada cannot be singled out in the global nuclear order for its history of sacrificing Indigenous communities and their land for nuclear development, whether for mining, nuclear tests, refineries, or siting of radioactive waste facilities (see Voyles 2015). At the same time, Canada's dominant self-image has been one of innocence and multicultural humanism in contradistinction to the racialized and aggressively militarized image of the United States. Arguably, then, Blow's film generated a catalytic moment for Canada's self-examination of its national history as one grounded on the extractive settler state's relationship to Indigenous life and the land.

Blow's documentary has, moreover, captured the attention of many cultural critics for its representation of an unprecedented encounter between the Dene and survivors of the Hiroshima bombing. In 1998 the

Uranium Committee sent a delegate to visit Hiroshima. The film narrates that the Dene had learned that, unbeknownst to them, the uranium mined from their land had been used to develop the atomic bomb that had destroyed the city. The Dene's unintended involvement in the incineration of people on a foreign land had long been foretold. According to the late Dene lawmaker and community leader George Blondin (1990), among the many Sahtú Dene stories is a prophesy of striking resemblance to what actually happened toward the end of WWII: a medicine man once prophesized that, "a long time in the future," strangers will come to dig up something harmful from their land which will be dropped on people who "looked like us, like Dene" and burn them all (79). The Dene delegate's visit to Hiroshima was thus underpinned by a keen awareness of the uncanny historical entanglement and the knowledge that their land and labor had been implicated in Hiroshima's destruction. In the film, Kenny-Gilday delivers a speech to her hosts in Hiroshima: "a Dene from Déline, I take on a personal responsibility for what's happened here" (41:54).

In *The Highway of the Atom*, van Wyck referred to the Dene delegates' travel to Japan as an unthinkable act of "apology." This characterization has invited further inquiries into the question of justice and accountability. This is regardless of the curious fact that, as the Native American and nuclear literature studies scholar Kyōko Matsunaga (2020) has astutely pointed out, none of the Dene interviewed in Blow's film uses the term, "apology." Nor did they indicate that the purpose of their trip was to apologize to the victims of the Manhattan project for their land having been implicated in the atrocity. For van Wyck, the Dene's unfathomable apology suggested an ultimate ethical attitude in the face of the environmental crisis. As I will discuss below, literary critic Molly Wallace followed van Wyck and appreciated Dene's "apology" as exemplifying a responsible attitude necessary for thinking risk society. Literary critic David Eng (2015) likewise addressed the Dene's sense of responsibility and, following Derrida, called it an "absolute apology." For Eng, the Dene's sense of accountability toward the history beyond their own making suggests an alternative to the conventional concept of reparations. It is indeed worthwhile noting that in his critique of the global proliferation of the truth and reconciliation commissions at the turn of the new century, Derrida (2001) distinguished between "conditional" and "unconditional" forgiveness. Observing the ways in which apology and forgiveness have become increasingly instrumentalized for the interests of states and other international actors, he insisted on "the necessity of maintaining the reference to an aneconomical and unconditional forgiveness; beyond the exchange and even the horizon of a redemption or reconciliation" (38). For Derrida, "the right

of grace could not be exercised without injustice" (47). As far as the film reveals, the Dene delegates' "apology," if at all, did not ask for forgiveness. To the extent that apology and forgiveness were not to be exchanged, Dene's gesture of apology was unconditional and precluded the injustice of the power/right of grace. In this sense, Dene's visit with the survivors in Hiroshima points to a horizon of new sociality, a justice without instrumentalization.

The Highway of the Atom was perhaps the first attempt to theorize the broader implications of the Dene visit to Hiroshima, specifically for ecocriticism. Noting how Dene were simultaneously "positioned as both victim and accomplice," van Wyck elaborated on this doubleness as follows: "as to the former [victim position], the Dene sought recognition and compensation from the Government of Canada [.] [...] As to the latter [accomplice position], they disavowed the vortex of history and archive, and also the vortical administrative discussions of sovereignty, rights and self-government, and moved directly into the realm of the ethical" (41). It is with regards to the latter position that van Wyck understood that Dene had visited Hiroshima to offer "apology to the Japanese" (19). The Dene apology, as he put, was "to assume responsibility for events over which one had no knowledge or control" (19). Characterizing the Dene's apology to the victims of U.S. nuclear attack as unfathomable—"something exemplary, unthinkable" (41)—van Wyck further generalized this unfathomability to draw an analogy between Dene's sense of responsibility and what he considered a new ethical paradigm of ecological thought. Ecological disasters and the way Dene's history was complicit in the nuclear disaster, as van Wyck surmised, are similar in that they both suggest the "unfathomable thread of causality" that led to what happened.[5] Dene's attitude about the historical connection between Port Radium and Hiroshima, then, "amounts to a paradigm [...] of the workings of ecological disaster. Something happens here and now, because it really happened over there and then. This [...] is par excellence the great conceptual achievement of ecological thought. Not the logic of [...] isolated events in time and space" (48). *The Highway of the Atom* thus drew parallels between Dene's apology and ecological criticism. It deciphered Blow's film to offer a conceptual framework for considering how we might respond ethically to ecological disasters and their complex of causes and consequences: namely, the unfathomable linkages that implicate us all, anywhere, anytime, beyond knowledge of our own involvement.

5 van Wyck extends Derrida's rendering, "the unfathomable threads of causality" (2010, 203).

Transpacific Nuclear Entanglements: *Burning Vision*

Canada-based literary critic Molly Wallace (2016) explored the works by Blow and a couple of other cultural workers that had thematized the history of uranium mining in the Northwest Territories. According to Wallace these texts can be regarded as constituting an archive of risk criticisms. As "a way to theorize the megahazards of the present," Wallace attempts to bring "nuclear criticism and ecocriticism together under the rubric of something like 'risk criticism'" (5). One of Wallace's primary concerns lies in what has been known since the turn into the new century as the "nuclear renaissance." *Risk Criticism* raises questions about the ways in which the political imperatives of carbon emission reduction and the shift away from dependence on fossil fuels have reignited the promotion of nuclear power as a renewable energy source. Wallace finds it especially troubling that such a pronuclear environmentalist stance has gained ground in many nuclearized countries despite the fact that the ongoing Fukushima crisis exemplifies the "worst circumstances" (182) of failed risk management, at least in the eyes of those who refuse to accept nuclear power as a solution to ecological disasters. Taking a cue from van Wyck's conviction that the history of Port Radium "amounts to a paradigm [...] of the workings of ecological disaster," (2010, 48) Wallace further extended this idea to argue that the site can also be regarded as a "paradigm case for thinking risk today" (2016, 26). If, as van Wyck insisted, the ecological thinking of environmental disasters such as climate change perceives that "something happens here and now, because it really happened over there and then," (2010, 48) precautionary thinking about unmanageable risks, nuclear or otherwise, similarly relies on a logic of connectivity among different times and spaces.

The Metis playwright Marie Clements's play, *Burning Vision* illustrates for Wallace the "importance of thinking across time and space" (159) in addressing risk through precautionary registers. The play portrays the Indigenous community of the Northwest Territories and its connection to Japan. It brings together the multiple trajectories of transpacific nuclear entanglement through the literary-theatrical plots of fictionalized encounters, overlapping temporalities, and interchangeable places and characters. Since it premiered in Vancouver in 2002, *Burning Vision* has garnered much critical appraisal in North America for its multiracial, multiethnic casting, multilingual stage production, and as a high-profile event in the history of the Indigenous theater performance. For example, Courtney Elkin Mohler (2015) directed the play with the understanding of "*Burning Vision* functioning as indigenous theatrical praxis that encompasses

a philosophy of ecological sustainability" (11) while Jaye T. Darby, et. al. (2020) notes that Mohler "recognized that play's complexity would require special audience engagement and education, such as an interdisciplinary symposium on the play's themes, an extended program and curated lobby display, and talkbacks with Clements herself" (168). If *Village of Widows* successfully exposed in documentary form the suffering of the Sahtu Dene people to the point of offering a foundational narrative for the subsequent cultural texts on this subject, *Burning Vision* reimagines Port Radium as a site from which the intersecting ontologies and epistemologies of the nuclear transpacific emanate.

Burning Vision stages the Dene prophecy through the voice of the Dene See-er who foretells the devastations the history of uranium mining would bring to both the Dene community and people in Hiroshima and Nagasaki. Known historical events — such as WWII as well as Canada's mining operations that had long been a void in historical knowledge — and the attendant memories, affects, and social identities are embodied in several interchangeable anthropomorphic figures. The two atomic bombs that destroyed the two Japanese cities are transmuted into two characters, one, an innocent Little Boy and the other, Fat Man, who poses as an iconic figuration of militarized masculinity. Miner, who mines the pitchblende at Port Radium, meets Radium Painter who paints "glow-in-the-dark" wristwatches. The latter figure invokes the history of women workers known as "radium girls" who were employed to paint wristwatch dials with radium, a material that turns luminous in the dark and was commonly used into the late twentieth century. Many workers developed radiogenic illnesses, including bone fractures and necrosis of the jaw. Radium, moreover, was a highly valued product which was also mined from the Eldorado Mine before accelerating demands for uranium.

Similarly in another scene, the Metis Woman's mixed-raced in-betweenness and her yearning for home and belonging are rendered analogous to the affect featuring Tokyo Rose/Round Rose, one of the interchangeable double-cast characters. Tokyo Rose's name derives from a historical figure, Iva Ikuko Toguri D'Aquino, an Asian American radio personality who is best known for her imprisonment after World War II on the charge of treason for her wartime pro-Japanese propaganda broadcasts, while its doubled-cast, Round Rose, is a fictional character. Not unlike the way the play positions Metis Woman, the doubled character of Rose is caught between two racial/national interpellations, thus making her loyalty and membership suspect. We learn that Rose eventually falls in love with Koji, a Japanese character who will be lost to the atomic bombing in Hiroshima. The closing act brings the Northwest Territories and Hiroshima into convergence

through Koji's Japanese grandmother. Grandmother, at discovering her grandson's death in the aftermath of the Hiroshima bombing, however, transforms into Dene Widow who awaits and mourns for her long-lost husband, a specter of a uranium ore carrier. *Burning Vision* thus stages cacophony and the overlapping encounters produced by the transpacific North American nuclear empire. The dead, ghosts, suffering, and grief in differently situated, multiple times and spaces are invoked throughout the play to be conjured up simultaneously.

In her attempt to bring "nuclear criticism and ecocriticism together" for the advancement of risk criticism, Wallace underscores the play's "technique of simultaneity, of overlapping times and spaces" (2016, 171) as an important literary device that can render the specific history of Port Radium into "a vehicle for considering other sorts of hazards" (185). For Wallace, Clements's *Burning Vision* presents "precautionary thinking associated with risk society" (188), a society faced with a whole array of toxicity, chemical exposures, and the hazards of climate change. Precautionary thinking about risk, according to Wallace, differs from the discourse of risk management which is "in effect an attempt to control the future" (187). The latter operates according to analogy: "past events will have been like future ones, and thus risk can be managed, mitigated, and insured against" (188). In contrast, the precautionary thinking disrupts this analogy across time and space by suggesting the unpredictability of the future. The play's nonreferentiality is especially effective in conveying this perception. It invites the sensibility for the unimagined, prompting us to question how we can make ourselves accountable for unknowable future catastrophes. "What the play offers," Wallace observes, "is [...] the uncertainty of the precautionary principle, a different orientation toward the future, with different implications for thinking about knowledge and responsibility" (173). Dene See-er's prophecy intimates such an uncertainty of knowledge and yet goes unheeded. *Burning Vision*, then, demonstrates the ways in which "risks, which are largely prospective, turn into catastrophes when risk management fails" (171). The clinching statement made by one of Clements' characters: "be sorry before you have to say you are sorry" (Clements 2003, 91) indicates for Wallace a responsible attitude necessary for precautionary thinking with which one can project present risks into the future so that unprecedented disasters can be averted.

When read in this way, even the play's use of a most commonplace post-disaster practice might appear to help reorder knowledge by linking nuclear crises to environmental disasters. In search of Koji after the destruction of Hiroshima, Grandmother leaves a handwritten note on a burnt cherry tree. The note reads: "If we ever get separated, you are to

wait for me here. Wait for me here and I will come for you" (Clements 2003, 111). In the ashes of the annihilated cityspace, people did indeed resort to the mundane practice of leaving such notes, hoping for the eventual safe return of missing family and loved ones. Yet this same practice of reaching out to missing persons has often been seen in the aftermath of other catastrophic events. Critics have long noted that prevailing atom bomb narratives intimate natural disasters such as earthquakes and wildfires, and that such naturalized representations of Hiroshima and Nagasaki have depoliticized nuclear narratives by obscuring the agency of perpetrators. But the immanence of the most banal practice of post-disaster message boards may suggest a material connection that is often disavowed yet critically illuminating. Rather than dismiss such a conflation as only contributing to the obscuring of critical differences between natural and human-made disasters, it is equally possible to insist, with Rob Nixon (2013), van Wyck, and Wallace, that the natural disasters of the Anthropocene and in the age of climate change are as much an outcome of the settler states' extractive militarized violence.

Between Nuclear Universalism and Decolonial Justice

In her examination of transpacific connections represented in literary works by Native North American writers, the nuclear literature scholar Kyōko Matsunaga (2000) contrasts *Burning Vision* with Blow's film. Matsunaga argues that while the latter offered the possibility of grasping Hiroshima's atomic bomb narrative within the context of colonialisms, *Burning Vision* hardly makes such a gesture. The trope of the cherry tree is especially troubling for Matsunaga because of its nationalist associations. She furthermore questions another critic's interpretation that Koji may be part Ainu, arguing that when his character is tied to the quintessentially nationalist and often militarized symbol of the cherry tree in the play, such a reading could end up cancelling out the colonial asymmetry between the ethnic Japanese and Ainu people.[6] Matsunaga thus concludes, by too easily connecting Dene's radioactive exposure to the "Japanese" atom bomb experience, *Burning Vision* fails to advance the decolonization of Hiroshima narratives that had been initiated by Blow's documentary.

Historical specificities of the nuclear injuries suffered by the Sahtu Dene community at the hands of the settler colonial state may in part appear muted in *Burning Vision* due to the unilinear, progressive temporality of the prophecy that consequently subsumes all contradic-

6 Matsunaga (2020, 49) on Sophie McCall (2012).

tory elements of the play. The overarching voiceover that prophesizes the disaster, into which the Dene land and its people would eventually become implicated, increasingly overwhelm the multidirectional traversals of time-space and the intermingling and interchanging of characters. The future anterior with which Dene See-er foresees Hiroshima's nuclear catastrophe is the play's ultimate endpoint. This framing lends the whole story a sense of preordainment. The play opens with and culminates in the familiar image of atomic explosion — the "sound of an explosion that lasts a long time and reaches far into the distance, until at last the explosion is complete and it is quiet," (8) although the final explosion is both that of the Hiroshima bombing and ones that are yet to come; elsewhere and anywhere. Meanwhile, Tokyo Rose/Round Rose eventually falls in love with a Japanese figure Koji and bears his child. The unseen future's serendipity is undermined by the unwavering telos of the unaborted reproductive temporality, as the double-cast Rose gives birth to a live child despite all the predicaments and tribulation. In this way, the play's initial positing of the disruptive potentiality of the cacophonic, multivalent emplotment of contradictory time, space, and characters becomes increasingly betrayed by the bomb's teleology as the play comes to close. In the final scenes the three disparate ticking sounds — of Miner's Geiger counter, the Radium Painter's 'glow-in-the-dark' watch, and the heartbeat of a fetus inside Rose — converge at the moment of explosion. Rather than suggesting the relationality among incidents of nuclear violence that are contingently grounded in different and distinct times, spaces, and positionalities, the fabulously complex characters and the confounding of time-space produces, in the end, a flattened-out impression, devoid of geohistorical and material differences. Clements's characters travel too freely. They are unmoored from historical specificities, until they become integrated under the exceptional narrative of Hiroshima's atomic catastrophe in their apparent assimilability, equivalence, and commensurability.

Matsunaga's discontent with the way the colonial theme recedes in *Burning Vision* prompts a further consideration of the predicaments of thinking and representing connectivity across time and space when garnering universalistic knowledge. For critics like Wallace whose primary concern is the risk of society at large, Dene See-er's prophecy suggests the essence of precautionary thinking about risk, whereby present knowledge, however uncertain, ought to be taken seriously to avert unforeseeable future disasters. Commenting on the stage production of *Burning Vision* by Annie Smith (2010), the Indigenous and performance studies specialist, Wallace appreciates the way in which Smith directed the stage performance so as to urge the audience "to read analogically, to see in these

new contexts [of other environmental harms] a repetition of a structure from the past" (Wallace 2016, 184). Smith directed the performance so that it "abstracts the nuclear content, rendering a mobile metaphor or allegory for risk more generally" (2016, 185). As Wallace observes, "though the play's subject matter is nuclear, Clements' abstract, symbolic, and suggestive treatment also renders the play more mobile, as, restaged in new contexts, it might speak to new risks […]. a vehicle for considering other sorts of hazards" (184). Wallace's exploration of risk criticism concludes with an assertion that the ecological ethics suggested by Port Radium "only becomes more apparent" when "like those islands in the Pacific…the people in the north are also disproportionately affected by climate change's uneven effects" (186). As *Burning Vision* becomes "a mobile metaphor or allegory for risk more generally," the referentiality of the Dene people's suffering and struggles becomes transmuted and rendered exchangeable, if not equivalent, with the suffering of others who have experienced analogous catastrophic environmental disasters.

It is here that I wish to caution against the marginalization of geohistorical specificities that such a universalizing hermeneutics might bring into effect. There are at least two contrasting ways of perceiving the Dene's connection to Hiroshima's nuclear annihilation. On one hand is a reading of Blow's documentary as that which addressed the long disavowed and incommensurable sufferings in a distinctly situated settler colonial context. On the other, is the valorization of commonality and universality extrapolated from the Indigenous community's history and its association with a generalized critique of 'the world at risk' and ecological thoughts that bypass considerations for 'sovereignty, rights and self-government.' This tension concerns what I once called the problem of nuclear universalism (Yoneyama 1999). Nuclear universalism refers to the normative idea that Hiroshima's nuclear catastrophe must be remembered from the transcendent and anonymous position of humanity, and that the remembering of Hiroshima's tragedy should invoke thoughts, sentiments, and moral attitudes not delimited by any national or geographical boundaries. It valorizes the remembering and understanding of Hiroshima's disaster from the anonymous, universal position of humanity, while marginalizing the knowledge produced by specifically named subjects. Nuclear universalism and its problem have manifested, for instance, in the disavowal and marginalization of Korean minorities' wish to mark their critical colonial difference in memorializing the city's past. It has moreover served to exceptionalize the atomic bomb as unprecedented in its scale and in history, while obscuring myriad other, less spectacular, everyday violence.

Etienne Balibar's theorization of universal humanism in relation to rac-

ism and sexism may prove useful in further illuminating the pernicious effect of this tension between what appears universal and that which becomes particularized by contrast. Balibar (1991) not only questioned how universal*ism* relies on the supplementary relation between the universal and the particular — that is, we regard something as universal only in contradistinction to that which is considered particular — even when what appears universal is in fact the provincial masquerading as universal. He also observed that modern organizations and ideologies have always regarded what is deemed universal (values, practices, beliefs) as superior to that which is less common, singular, hence particularized. It is not difficult to see, then, how the extrapolation of cultural productions thematizing Dene's nuclear entanglement for the purpose of universalistic criticism (that supposedly concerns humanity as a whole) could threaten to render questions of sovereignty, land rights, settler violence and nuclear colonialism (faced daily by Indigenous peoples) as particularistic and provincial, hence secondary.

Perhaps one of the most illuminating accounts of the problem of nuclear universalism on a global scale has been Gabrielle Hecht's investigative history of uranium mining and trade (2012). Deploying the neologism, "nuclearity" — a concept that suggests whether a thing can be considered nuclear is contingent on the negotiation between techno-scientific knowledge and power — Hecht's work powerfully demonstrated the ways in which Africa as a site of resource extraction has been marginalized in the discussion of nuclear-related issues at large.[7] African nations such as the former Belgian Congo (The Republic of Congo) and Angola have been central to the geographies of the global nuclear complex and the world market in which uranium has been traded as a "banal commodity" (2012, 35). And yet, the catastrophic signs of annihilation, mushroom clouds, and the blast — Akira Mizuta Lippit's "catastrophic light" (2005) — that came to predominate the Global North's nuclear imaginary have consequently overshadowed the serious and daily radiogenic harm the transnational mining industry and the global uranium trade have inflicted on Indigenous African communities. Much like Kuznick's narrative that illuminated mid-century transpacific entanglements by co-conjuring the two temporalities of wartime and peacetime, Hecht's narrative on uranium mining and the market — and how they have been integral to Africa's colonial and post/neocolonial histories and the question of sovereignty — exposed how profoundly much of our knowledge is spatially segregated and managed in the service of the transnational nuclear order. To borrow from the cultural critic Iyko Day's succinct summary:

7 Hecht (2012) on the distinction between radiation as "a physical phenomenon that exists independently of how it is detected or politicized" and nuclearity as a contingently "technopolitical phenomenon" (5).

> [I]t is largely Indigenous people across the globe who experience the chief impact of the entire nuclear fuel cycle, from uranium mining and refining to nuclear power and weapons production and testing [...] [Indigenous communities in Africa and North America] are the largely unknown zones of resource extraction where Indigenous land and communities are targeted for what Traci Brynne Voyles calls 'wastelanding'" (2018, 85).

It is precisely because of the disproportionate burden the Indigenous communities have had to endure that scholars like Matsunaga (2019) insist that we need to turn to Native North American literatures and thoughts for post-nuclear epistemologies of survivance. How are we to know and act otherwise across these pernicious spatial and temporal nuclear divides? Once again, there is an urgent need for critical methodologies with which we can sensitize ourselves to what the colonial order of nuclear knowledge necessarily elides, subjugates, and makes unknowable.

Whether or not "apology" is an apt characterization, the reparative investment in Dene's Hiroshima visit cannot go unnoticed in Blow's film. The Sahtu Dene people's understanding of their relationship to the land, and the sense of responsibility for people they encountered on their journey to Hiroshima, may be deemed as gesturing toward an alternative ethics and accountability. But if we are to seriously consider the existing transnational nuclear order and Canada's settler condition, we are equally compelled to read Blow's film along its narrative grain. At the film's outset the director introduces Kenny-Gilday who announces the purpose of the journey to Hiroshima: "It's a justice issue for them. On many, many, many levels. They have to make amends of some kind. So, they have to go to the surviving relatives of the Japanese people and say, this is the way it happened. And in telling that story, they heal themselves" (5:04–5:11). This opening proclamation is followed through in the film's final ten minutes with a seemingly fulfilling narrative and images about the revitalization of Sahtu Dene values and spirituality. Kenny-Gilday's interview is inserted, once again, but this time to observe, "there's a whole ritual and culture building around what is a big hole" (35:11).

The vibrant scene of ceremonial gatherings in Déline, trailed by cuts from the delegates' visit to Hiroshima, brings closure to the story. Blow, thus, quite literally denotes that the Dene's visit to Hiroshima bears profound significance for the healing and revitalization of the Indigenous community nearly decimated by Canada's uranium mining. Reparation and healing are sought 'in telling that story' of 'the way it happened,' that is, the collective ability to recuperate the long-redacted knowledge of their land's association with the bomb and to tell their story as the subject of

that history in their own manner. At the same time, the concept of justice Blow's film has brought to light must operate "on many, many, many levels," as in Gilday's words. When violent histories are grasped as deeply entangled and mutually implicated — as in the way the Sahtu Dene people felt about the destruction of Hiroshima — and precisely because many of the entangled acts of violence are slow, structurally overdetermined, and ongoing — as in the case of Canada's settler colonialism, extractive transnational capitalism, climate change, and the harms of residual radiation — justice for such multilayered violence cannot be attained uniformly and one-dimensionally through a linear path from the past injury to a repaired future. Rather, justice must be conjured as polyvalent, overlapping, and sought on multiple, intersecting ways.[8] Reconciliation and remediation attempted through a single, homogenizing trajectory of justice will ultimately invite unredressed remainders to return to undo that which appears settled and complete.

Conclusion: Radiontology, Ghosts, and Decolonial Nuclear Criticism

Fukushima Daiichi's unfolding nuclear crisis continues to affect the soil and water, the mountains and forests, humans, fish and animals, the dead and the unborn, within and beyond the national borders and across the oceanic currents. For those who hold the Fukushima incident close to their hearts and memories, vicarious or immediate, it is tempting to believe that the relational awareness about histories' entanglements — such as the one addressed by Blow's film — is a post-3.11 or post-Fukushima epistemology. Indeed, there are many who argue that such an ethos emerged after 3.11 (see Komori 2014; Genkaiken 2017). Japanese literature scholar Kimura Saeko (2013; 2018), among others, has identified what she calls the genre of "post-earthquake" literatures and criticism. According to Kimura's post-earthquake literary critique (2018), literatures that were produced since the 2011 earthquake figuratively, but sometimes straightforwardly, evoke the mass deaths brought on by the earthquake and tsunami, but especially the apocalypse suggested by the Fukushima meltdown in relationship to the familiar tropes of Auschwitz, the two World Wars, Hiroshima and Nagasaki, Minamata disease, and Chernobyl. Kimura suggests that post-earthquake literatures can conjure up memories of disasters across different times and spaces in part because one distinctive quality of radiation is that it is unfathomable and knows no geographical and temporal boundaries.

8 Yoneyama (2016) on the limits of redress, reconciliation, and forgiveness.

We need not evoke the registers of iconic human tragedies such as Auschwitz and Chernobyl to appreciate how Fukushima's crisis has been understood as intimately and relationally entangled with other, less spectacular yet ongoing violence of the transnational nuclear order. On April 6, 2011, Yvonne Margarula (2011), representing the Mirrar people in Australia, sent a letter to the then UN Secretary General Ban Ki Moon. In it she reiterated her people's long-standing objection to uranium mining on their land and expressed solidarity with people of Japan based on the understanding that at least some of the uranium that fueled TEPCO's Fukushima Daiichi reactors was extracted from their land. Since the 1970s Japan has imported the uranium from Mirrar land. The letter reads: "Given the long history between Japanese nuclear companies and Australian uranium miners, it is likely that the radiation problems at Fukushima are, at least in part, fueled by uranium derived from our traditional lands. This makes us feel very sad [.] [...] [The nuclear industry] is an industry that we have never supported in the past and that we want no part of into the future. We are all diminished by the awful events now unfolding at Fukushima." Not unlike the delegates of the Sahtu Dene people who needed to tell *their* story of the Eldorado Mine, Manhattan Project, Hiroshima, and "the way it happened," Margarula's letter addressed the way her land has been implicated in the suffering caused by Fukushima's nuclear emergency. The letter expresses "sadness" as a collective sentiment — sadness at both the knowledge of how her community has been tied to Fukushima and the counter-historical realization that, if not for their existence diminished by the transnational settler-corporate interests, the disaster might have been averted.

Radiation is indeed ghostly; it is a presence in absence. It exists yet often escapes our sensory perceptions in its absented presence. Its effects — or especially what medical scientists have called the "radiation late-effects" — can manifest only belatedly. Like ghosts, radioactivity lingers on with us without our knowledge, in our bones, soil, and water. It reappears unannounced in unanticipated times and spaces. And this radioactive ghost, like Gordon's, has agency. In their materialist reading of Clements' *Burning Vision*, the Diné (Navajo) cultural critic Lou Cornum (2020) appreciated the way it represents radiation as "generative." Like radio waves, an element Clements deployed in the play, radiation has "the capacity for connection." Because radiation actively "seeks to dissolve the discrete national and continental boundaries," according to Cornum, "the obscured bonds and binds" are illuminated in "the invisible force of radiation."

To think and live nuclear by rendering agency and force to this ghostly presence of radiation, as Kimura and Cornum have, might be best described as radiontology. We can define radiontology as an onto-epistemology that comprehends radiation and its physical effects in their singularities, while acknowledging their agency and animate power. Radiation brings humans into negotiation with its activities in such a way that would forge knowledge, sociality, politics, and even alliances but without evoking universal history and its subject. And like ghosts, radiation claims a place but only in transience, not to settle but to unsettle. In fact, we can detect the social force of radiation and its performative agency in the encounter between the Dene delegates to Hiroshima and the Korean atom bomb survivors. This scene in Blow's film has caught many critics' attention as a meeting between two colonialisms, but without ever having probed its history and how such a connection became possible in the first place.

The Kawamura Hospital that the Dene delegates visited — which was mistakenly captioned in the film as "Korean Hibakusha Hospital" — began accommodating overseas *hibakusha* (those exposed to the atom bomb and/or radiation) in 1984 to support the grass-roots activism which had sought to extend application of the government subsidized medical care beyond Japanese denizens. The activism was led by a handful of Hiroshima survivors who saw the acute asymmetry between their officially sanctioned status in Japan and the Korean survivors who had left Japan to return to Korea after the latter's liberation from Japanese colonial rule. Radiation's immediate and belated effects on the survivors' bodies require long-term care and treatment and, yet, Korean *hibakusha* in Korea had not received the same level of attention as Japanese and Korean *hibakushas* living in Japan. It was the survivor-activists' embrace of radiation and its adverse, often fatal, effects that manifest unannounced and much belatedly that compelled them to organize a fund-raising campaign and instituted a network, with the involvement of local doctors such as those at Kawamura hospital, through which they could bring overseas survivors to Hiroshima for medical examinations and treatment. At the time of Blow's filming, Toyonaga Keisaburō, a schoolteacher who had led this activism from the outset, suggested that George Blondin and his fellow delegates visit Kawamura Hospital where Yi Hong-I, Roh Sŏk-I, and Jung Bunsŏn, among others, were staying for their three-months visit from South Korea.[9] For Toyonaga and others, their campaign did not aim to reconcile the colonial difference between the Japanese and Korean survivors (Yoneyama 1999, 169). Lobbying for the broader governmental and societal support through the rhetoric of equal treatment for all *hibakushas*, the campaign did not presume equivalences among different *hiba-*

9 Personal correspondence, September 15, 2022. See Toyonaga (2001) for his autobiography and the activism.

kusha experiences. Their activism did not propose to reconcile the asymmetry in the two positions of former colonizers and the colonized but, instead, embraced it as a historical present, while pushing for social and political changes so that the lingering radiogenic effects of cancer, malaise, alienation, poverty, and unending fear could be addressed and redressed simultaneously. In other words, their activism has long been propelled by the awareness about the geohistorical situatedness of Korean and Japanese survivors, just as much as it appreciated the specific ways in which the Sahtu Dene visitors have been made to suffer under settler colonialism. The encounter of the two colonialisms in Hiroshima could not be presumed and was therefore far from automatic. It was the product of the long, laborious local reckoning of colonial entanglements and incommensurability, a process subtended not by another universalism but radiontology.

Concurring with theater art scholar Theresa J. May (2010), who considers *Burning Vision* a performance of "transnational countergeography" which can render "previously invisible relationships explicit and meaningful," (7) Cornum concludes that the play makes "visible the intimate connection between settler expansion within North America and Western imperialism abroad while also posing possibilities for border-crossing and unlikely alliances" (2020). In contrast to the universalist extrapolations of *Burning Vision*, however, both their responses do not subordinate local imperatives for decolonization. Here, Cornum, along with May, finds a co-conjuring practice at play in Clements's complex and provocative confounding of time-space, by pointing to the way it sheds light on otherwise unknown connections and relationality. If etymologically 'to conjure' means not only to call upon but to also band together to adjure, co-conjuration can then be thought of as a practice insisting that the loss and violence experienced in different historical contexts at distant places and by alien people are evoked as related and grieved together. Co-conjuring thus sensitizes us to the gaps in our knowledge, urging us to wonder how a nuclear order we picture may begin to look differently if we learn to mourn the death of a Dene ore carrier, together with the long-overlooked suffering of survivors in Korea, the contaminated water affecting the Mirrar people, the disappearance of caribous in the Northwest Territories, and the continuing forced evacuation of human residents in some towns of Fukushima.

Our interconnected-ness, of course, is a result of the centuries-long expansion of the capitalist political economy which has thrived by the logic of equivalence and the ability to convert and instrumentalize all things and ideas as exchangeable across different geographies. We are connected as

well by our own implications in the histories of imperialism and colonialism which seem to have left no externality to the political modernity of the racialized Enlightenment and its regime of respectability. Yet, as Vimalassery, Hu Pegues, and Goldstein (2016) have problematized, these same structuring processes are sustained by the "colonial unknowing" which hides the very relationality and connectivity they themselves produce. The practice of co-conjuration I have tried to elucidate helps upset the comfort we take in the *un*knowing of intimate associations among different nuclear histories and irradiated geographies. It compels the sense of interconnectedness. Appreciating relational connectivity, however, cannot be confused with building another version of humanistic, universal knowledge based on putative sameness and surface commonality at the expense of the geohistorical specificities of radiontology. Co-conjuration, then, must hold in tension sensibilities for interconnectedness on one hand, and on the other, the ability to perceive radical incommensurabilities and to refuse false equivalences, assimilation, and facile analogies.

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Jessica Hurley

The Pikinni Ghost: Nuclear Hauntings and Spectral Decolonizations in the Pacific

Abstract: In his 1962 account of US nuclear tests in the Marshall Islands Neil O. Hines described irradiation as a practice of haunting, figuring radiation as “the faint footprints of the Bikini ghost” (72). This essay takes up the different conceptions of the ‘Bikini ghost’ constructed by the US nuclear complex and by Indigenous ri-M̧ajeļ to theorize nuclear decolonization in the Pacific as a mode of living with ghosts. The first part of the essay analyzes the 1957 return of the surviving members of the Roñļap community to Roñļap. In this repatriation the US was uncharacteristically concerned that the Native population would return to their ancestral lifeways; I read this concern as an attempt to exorcize the ‘ghost’ of radiation culturally in ways that could not be achieved physically, keeping alive the idea that radiation was non-apocalyptic at a key moment in Cold War nuclear debates. The second part of the essay analyzes Kathy Jetñil-Kijiner’s 2018 video poem *Anointed* as a decolonial approach to nuclear ghosts. Built around the image of the cracking Runit Dome, *Anointed* stages the return of the nuclear past: the nuclear materials that are literally seeping into the present through the cracks in the containment dome, and the histories of mundanely apocalyptic colonial violence that these materials both figure and perpetuate. While Western models of (nuclear) haunting insist that the ghost must be exorcized or contained, however, Jetñil-Kijiner reclaims the haunted oceanscape as a site of relation within Marshallese epistemologies to produce a resurgent decolonial reality that includes nuclear ghosts in its practices of care.

Keywords: Native Pacific, nuclear colonialism, decolonization, Kathy Jetñil-Kijiner

On the island of Runit, between the enclosed lagoon of Ānewetak Atoll and the open Pacific Ocean, there is a crypt. Buried under a concrete shell, uncannily animate, are over 3.1 million cubic feet of highly radioactive materials: military hardware; nuclear weapon fragments; pulverized and toxified coral; irradiated soil and vegetation not only from the atoll oceanscapes destroyed by the United States' 67 nuclear bombings of the Marshall Islands but also from other Native lands on far-off continents (Rust 2019).[1] The Runit Dome was built by the US army and completed in 1980. The people of the atoll call it 'The Tomb.' Like every crypt, it is supposed to lay the past to rest, to seal off the baleful influence of past (mis) deeds and keep the present safe from those things done or left undone. And like every crypt it leaks.

The Runit Dome, cracked and leaking radioactivity into the surrounding lands and waters, is both a material object and a figure for the nuclear past, for what gets buried and what refuses to remain underground. Radiation itself captures the imagination for its agential capacity in spacetime, the refusal of radioactive materials to be bound in space and their ability to extend temporally across millennia that Joseph Masco has influentially called the "nuclear uncanny" (2006, 27). This uncanny, in the Western tradition that inherits it from the gothic, is often experienced as monstrous. Gabriele Schwab's recent *Radioactive Ghosts*, for instance, describes how "[if] this [nuclear] archive is ever opened, the ghosts buried there will haunt the distant descendants of humans as radioactive ghosts, inflicting damage and death, if not annihilation. It is as if they were vengeful ghosts, taking retribution for a violation of the earth in a far-distant past" (2020, 206). Traci Brynne Voyles similarly figures uranium through the vengeful dead, describing how "environmental and social ruin have turned the planet into a visceral kind of haunted house, a closed ecosystem haunted by cyborgs, ghosts, cannibals, zombies, and the dead" (2015, 215). The nuclear ghost, in these analyses, is in monstrous opposition to the human; something to be exorcized, beheaded, staked through the heart.

As Rebecca Hogue has recently argued, however, the framing of nuclear aftermaths as externalized monsters requiring violent retributions risks both abstracting and erasing the ongoing realities of nuclear harm (See Hogue 2021a).[2] In stark opposition to these violent retributions, the Marshallese poet Kathy Jetñil-Kijiner's 2018 video poem *Anointed* presents a very different set of possibilities for relating to the nuclear crypt. Filmed in collaboration with Dan Lin and the people of Runit, *Anointed* depicts Jetñil-Kijiner in relation to the 'Tomb' as she conducts an ancestral mourning ritual on its surface (Figure 1).

1 In 2019, the *LA Times* broke the story that the US had exported 130 tons of highly irradiated soil 1,300 miles from the Nevada test site to the Marshall Islands for interment in the Runit Dome. See Rust (2019).

2 The most familiar figure of the nuclear past emerging into the present is of course the monster or kaiju, in particular Gojira/Godzilla. See Hogue (2021a) for the twentieth-century nuclear monster and Cho (2018) for its twenty-first century, post-Fukushima iteration. The nuclear ghost, however, operates at a different scale and in a different affective register than the nuclear monster, making different demands on the present and requiring different solutions.

Figure 1: Kathy Jetñil-Kijiner and Dan Lin, "Anointed," 2018. 04:28.

In this essay, I consider the nuclear ghost through two different lenses: the Western nuclear gothic, which sees the ghost as something to be exorcised, and the Marshallese epistemology of relation with land-bound ancestor-spirits that holds irradiated lands, waters, and bodies as part of a Marshallese world that is not to be banished or excluded. Through an analysis of the US nuclear complex's writings about the Marshall Islands, I show how the narrative framework of the nuclear gothic led to devastating consequences for ri-M̧ajeļ as the US forced them to live on irradiated atolls as a way of exorcizing the nuclear ghost. I then turn to an analysis of Jetñil-Kijiner's *Anointed* as an example of how ri-M̧ajeļ have insisted on relating to the nuclear past within Marshallese epistemologies and ontologies as a way of decolonizing their relationships with the atoll oceanscapes and the nuclear pasts that they continue to manifest in the present. Taking up the historical and material burden of this legacy, Jetñil-Kijiner shows how, in Keith L. Camacho's words, "while the militarized cartographies of U.S. empire may continue to haunt us, the foundational and emerging works of Pacific Islander artists, poets, scholars, student activists, and many others are contributing to a transoceanic consciousness rooted in social and political justice" (2011, xxvii). Co-existing with the nuclear ghost as an ancestor-spirit rather than insisting on its exorcism, Jetñil-Kijiner and her collaborators imagine and demand a sovereign relation to histories of damage that works towards justice and decolonization in the present.

'The Bikini Ghost'

Between 1946 and 1958, the US detonated 67 nuclear weapons on the Marshall Islands. Each weapon released more radioactivity than the bombs dropped on Hiroshima and Nagasaki. As "tests," the official function of these bombings was not to wage war — although "undeclared nuclear warfare," as Masahide Kato has argued, was waged — but to gather data (1993, 339). The institution responsible for gathering data about the biological impact of radiation on oceanic ecosystems was the Applied Fisheries Laboratory (AFL), a lab established at the University of Washington in 1942 as part of what would soon be named the Manhattan Project in order to study the potential impact of plutonium toxicity from the soon-to-be-opened Hanford plutonium processing plant on the piscine life of the Columbia River. Under the direction of the fish biologist Lauren R. Donaldson the AFL became a major part of the US nuclear testing complex in the Pacific after the end of World War II, designing and conducting the major experiments that would examine the movement of radiation through the Pacific environment and track its effects on atoll ecosystems in the Marshall Islands. In 1962, the laboratory's administrator-publicist Neil O. Hines published an institutional biography of the AFL, translating the memories, memos, and scientific reports of a scientific laboratory into a narrative account of the lab's experiences and findings in the Pacific. Written for a general audience, *Proving Ground: An Account of the Radiobiological Studies in the Pacific, 1946–1961* combines accounts of scientific processes with narrative tropes from the Robinsonade to the Pacific adventure story to the mid-century spearfishing report to paint a multilayered picture of how the US nuclear complex perceived the Marshall Islands and their Indigenous inhabitants; and how those perceptions shaped the decisions made by the colonial powers, including the laboratory itself.

The nuclear ghost makes its first appearance, for Hines, during the first return of the AFL to the Marshall Islands after the 1946 Operation Crossroads test series at Pikinni Atoll, the first post-war nuclear detonations and the first to be conducted at the US's new colonial holdings in the Pacific.[3] While the first detonation, Test Able, was somewhat smaller and more contained than expected, the second, Test Baker, was larger and more messy, dispersing highly radioactive water, soil, and pulverized coral over much of the atoll. As part of their initial report on the biological impact of the test, the AFL recommended that follow-up studies be done at Pikinni the following year "to further the studies of population changes and provide information on genetic problems" (Hines 1962, 48). The resur-

3 For the colonial structure of the Strategic Trust Territory designation see Bahng (2020).

vey was approved, and on July 1, 1947 the Bikini [sic] Scientific Resurvey team sailed from San Diego aboard the USS Chilton (57).

In his summation of their findings, Hines deploys the figure of the nuclear ghost to describe the uncanny lingering of radiation within the atoll's ecosystem:

> If the atoll were considered as a whole, reassurance was there. On the floor of the lagoon, beneath the former target center, lay half a million tons of radioactive mud. But on the islands and reefs and in the waters of the lagoon—even where there existed a mysterious turbidity—life still appeared to thrive and flourish. Even where the faint footprints of the Bikini ghost could be detected they apparently were being dimmed by sun and wind and water. Tiny hermit crabs continued to haul their shells across the sands, making small traces. Big blue and brown coconut crabs stalked as usual through the fallen husks on Namo Island or stared in beady solemnity from the recesses of their burrows amid the roots of palm trees (72).

In Hines's account, the "Bikini ghost" is situated in a specific relationship to both the past and the future. Like more traditional ghosts, the ghost of radiation is the trailing aftereffect of past (mis)deeds; Pikinni is haunted by an invisible, agential being that can be perceived only by the traces it leaves behind, the "faint footprints" in the sand and water. In the nuclear gothic imaginary, as with other forms of ecogothic that figure environmental violence through "gothic slippages in time (with past and present meeting through the built environment) and in agency (with land and infrastructure taking on uncanny powers and abilities to act)," Pikinni is the haunted house and radiation is its resident ghost (Evans 2021, 446). In this sense, the Pikinni ghost could be interpreted through the lens of existing ghost theories: as Schwab and Voyles argue it is the trace of past nuclear violence, and following the hauntologies developed by Jacques Derrida and Avery Gordon it could be seen as a call for responsibility towards that historical violence, with the footprints of radiation functioning as the "seething presence" (Gordon 2008, 8) of the past in the present, a presence that calls us to "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" (Derrida 1994, xviii).

Hines's framing of the temporality of the nuclear ghost, however, produces quite a different set of conclusions about the call of historical responsibility. For Gordon, "[being] haunted draws us affectively, sometimes against our will and always a bit magically, into the structure of feel-

ing of a reality we come to experience, not as cold knowledge, but as a transformative recognition" (2008, 8). For Hines, however, and for the nuclear complex more broadly, addressing the nuclear ghost requires not transformation but continuity. The most striking thing about Hines's moment of nuclear gothic is how efficiently it evokes both the presence of the nuclear ghost and its exorcism — an exorcism that is figured as both natural and inevitable. It is not historical responsibility that is required to exorcize the nuclear ghost; Hines does not conclude that the US nuclear complex is required by the ghost's presence to clean up the radiation lingering in the landscape, or to stop detonating nuclear weapons to prevent the raising of more such ghosts. Rather, time and nature are imbued with the power to settle nuclear ghosts. It is "sun and wind and water" that will "dim" the ghost to nothing over time, and it is the normalcy of nature's creatures that limn the limits of the ghost's power of transformative disruption. As long as "hermit crabs continued to haul their shells across the sands" and "coconut crabs stalked as usual through the fallen husks" (Hines 72), the AFL and the nuclear complex in which it is embedded can treat radiation as "cold knowledge," data to be studied rather than a revenant producing "transformative recognition" of the AFL's complicity in nuclear harm (Gordon 8). As long as things figured as natural and temporally uninterrupted continue "as usual," in other words, the US nuclear complex can evade the call of responsibility and justice coming from the nuclear ghost (Hines 72).

Understanding the continuity of 'nature' and those things figured as 'natural' as a key part of exorcizing the nuclear ghost and silencing its call for justice allows us to make sense of one of the most cryptic sets of decisions of the US's occupation of the Marshall Islands: the 1957 return of the ri-Roñļap to Roñļap, and the subsequent refusal, when the ri-Roñļap realized that they were being injured by the radiation on the atoll, to evacuate them to a safer place. As I have argued elsewhere, the US nuclear complex saw itself as settler-colonizing the Marshall Islands through its nuclear tests on the oceanscape (Hurley 2022). In this context, occupation of the land/ocean and "elimination of the native" go hand in hand as the settler colony seeks to build over Indigenous reality with its own (Wolfe 2006, 387); in the Marshall Islands, occupying the oceanscape with military installations and suburban housing or with nuclear radiation both serve the same function, rewriting the oceanscape as properly American rather than Marshallese (Hobart 2021; Hurley 2022). And yet Roñļap came to serve a very different function for the US, as rather than embracing the transformation of the atoll from Marshallese to American the US insisted on its restoration to a Marshallese way of life.

Roñļap — or more specifically its Native inhabitants, since US personnel were evacuated immediately — was evacuated two days after it had been horrifically irradiated by the detonation of the US's first thermonuclear weapon during the Bravo test in March 1954. In June 1956, even though the island was at that point still considered too radioactive for human inhabitation, the Los Angeles architects Holmes & Narver were authorized to start drawing up plans to rebuild the Native village. At this point, the District Administrator of the Trust Territory had already completed a report outlining "the housing and other community needs of the Rongelapese people on their return" (Hines 1962, 234–5). In July of the same year, Holmes & Narver personnel, representatives of the Trust Territory administration, and members of the native council visited Roñļap "to consult on the sites of the new living areas and on plans for dwellings and community facilities, including a new chapel to replace the dwellings destroyed by fire" (235). In February 1957 permission was given by the AEC to repatriate the ri-Roñļap; construction was completed in June, and the surviving members of the Roñļap community (plus new children) were returned to Roñļap on June 29, 1957.

This historical outline gives the bare-bones account of the repatriation, but it fails to capture the obsessive nature of the combined Atomic Energy Agency-Trust Territory-AFL attempt to make ri-Roñļap be "native" to the island again. When AFL returned to Roñļap in the spring of 1958, they recorded, with some concern, that "coconut cultivation was not yet re-established on the old basis. Neither breadfruit nor papaya was available[.] [...] Domestic animals and fowls were still in short supply. The native diet was [...] supplemented by supplies of C rations provided under the auspices of the Trust Territory" (251). Hines describes a distinctly awkward scene in which AFL personnel "gathered samples of native food materials from land and water — coconut, pandanus, arrowroot, squash, and morinda on land, and the giant clam, coconut crab, land hermit crab, shore crab, snail, reef fish, and pelagic fish in the lagoon — and [...] attempted to establish in the Rongelapese an understanding of the need for continued periodic attention to themselves as individuals and to the environment in which they lived" (251). The AFL approaches the repatriation of ri-Roñļap here as some form of 'rewilding,' in which the ri-Roñļap must be reminded of what the "native food materials" are and instructed in how to inhabit their home environment (251).

When ri-Roñļap failed to somehow move back in time, as if it were possible to undo three years of exile, forced medical experimentation, and living in close quarters with the US nuclear complex, it was a source of extreme anxiety for both the AFL and the colonial administrators in

charge of the Trust Territory. Hines reports that in 1958 the High Commissioner of the Trust Territory, Delmas H. Nucker, had "substantial" concern that "the three years of medical care and enforced dependence at Majuro had deprived the Rongelapese of opportunities and incentives to care for themselves, and the months since their return, in which they continued to receive supplementary foods such as rice and C rations, had demonstrated that they still were far from ready to attempt to make their own way on the old basis" (254). By July of 1959, things were even worse:

> two years after their repatriation, it was evident that the Rongelapese as members of a community group were not moving as rapidly as had been expected toward readjustment to 'normal' atoll life. A measure of this delay was the failure of their agricultural production to supply sufficient food for the population. The use of supplementary supplies of C rations and rice had been protracted, necessarily, far beyond the original calculation. Trust Territory agricultural specialists were giving all possible aid to the effort to increase production of coconut, papaya, pandanus, and breadfruit, the atoll staples, but still production lagged. The mood of the Rongelapese was not now unhappy; it was, rather, one of weariness with attentions that seemed never to end[.] […] They were not ready, or did not know how, to take charge of their lives again (258).

While the toxification and enclosure of traditional foodstuffs and their replacement with highly processed Western goods has had a terrible impact on Marshallese health, as it has for people in Native nations in North America, this has not traditionally been seen as a problem for the settler colonial state. For the AFL, however, this is a crisis that must be addressed; a crisis so extreme that even the AFL, whose budget and professional identity relied on being able to extract data from the Pacific, agreed to a year-long moratorium on visits to Roñḷap in the hope that ceasing interactions with outsiders would allow ri-Roñḷap to return to their "natural" state and "take charge of their lives again" (258).

To some degree, this concern can be laid at the door of the nature of the Trust Territory designation under which the US had control of the atolls. The legal fiction of the Trust Territory, first designed after World War I to avoid decolonizing German colonial holdings, did not officially allow for colonialism as permanent occupation; rather, the role of the occupying nation under the UN mandate was to "guide" the people of the Marshall, Caroline, and Mariana Islands towards self-government. This mandate "'committed' the United States to fostering the political, eco-

nomic, social, and education advancement of the islands" (Hanlon 1998, 52). The US thus had a fuzzily defined (to the point of irrelevance, as the use of the islands for nuclear testing demonstrates) "caretaking" mandate for the Marshall Islands within which rendering them uninhabitable may have been a bad look.[4] Yet the language of advancement could have provided a very different approach towards the repatriation of ri-Roñļap, as it did with regard to the Indigenous nations of North America and indeed in the rest of Micronesia. In North America the "civilizing mission" was the direct obverse of the restoration of Roñļap, with genocidal infrastructures from the residential school to the adoption system designed to force Indigenous people out of their lifeways (described as "backwards") and into what the colonizers saw as Western modernity. In the Marshall Islands, meanwhile, the discourse of development was fully underway on other atolls; by the 1970s, for instance, the island of Kuwajleen in Kuwajleen Atoll had been fully transformed into an American suburb serviced by a Marshallese community living in slum conditions on neighboring Ebeye, with this transformation seeming to be perfectly in accord with the progress narrative of the civilizing mission granted by the UN mandate. When so much of America's colonizing impetus is to force Native peoples into 'modernity'—including by removing them from their land and replacing their access to traditional foods with the equivalent of C rations—the Trust Territory designation cannot fully account for the nuclear complex's obsession with getting ri-Roñļap back onto Roñļap and restoring them to their 'normal' way of life.

Rather, the crisis experienced by the nuclear complex on Roñļap stems from the fact that, for them, the uninterrupted continuity of "natural" life was required in at least one location in order to prove that the nuclear ghost could and would be settled on its own. We can see in the nuclear complex's writings here the enormous investment in (re)producing the ri-Roñļap as 'natural' beings: first they have to be coded as part of 'nature' (obviously drawing on hundreds of years of Western perceptions of Pacific Natives as being a part of their tropical environment)—hence, no C rations—and, as such, the nuclear complex must be able to demonstrate that their 'natural' lives have continued undisrupted over the apocalyptic rupture of nuclear bombing. The nuclear ghost, like other ghosts, figures time out of joint; only the placid, unchanging continuity of the sun and the sea, the coconut crab, and the hermit crab, and finally the ri-Roñļap can exorcize it and silence its calls for justice. Roñļap thus developed a totemic power for the US nuclear complex, one which would bind the US to keeping ri-Roñļap on Roñļap whether they wanted it (as in the runup to the 1957 repatriation) or not (as when the US refused to evacuate the Roñļapese in

4 Image being the important thing here, since the US had complete sovereign power over the TTPI which could not be challenged by the UN or any other nation (Hanlon 1998, 52).

1984 after the appalling health impacts of living on an irradiated atoll had become apparent, abandoning them on the radiotoxic island until they were rescued a year later by the Greenpeace ship *Rainbow Warrior*). In a rare exception to how the settler colonial state normally perceives land, Roñļap was remarkably non-fungible: ri-Roñļap had to return to this atoll and they had to live upon it in the traditional way.[5]

Of course, the story of the return to Roñļap looked very different from a Roñļapese perspective. In addition to the illnesses caused by the radiotoxic environment, the irradiated nature of the atoll also disrupted the customary traditions that the AFL and the Trust Territory administrators so desired to see restored. In an interview with Joanne Barker in 1999, Mike Kabua described how radiation distorted the "social roles" that structured Marshallese society (Barker 2004, 77):

> *Iroij* visits to Rongelap after 1957 were difficult. The people were required to give food to their *iroij* even when the food was contaminated, such as coconut crabs, because of the cultural importance. People didn't want to give contaminated food to the *iroij*, but they had to. By the same token, the *iroij* didn't want to accept the contaminated food, but had to. The *iroij* was scared of eating coconut crab, but it is so important to give coconut crab to the *iroij* that the *iroij* could kick people off the land for not giving it to him. The people were also afraid the *iroij* would reject the food (Barker 2004, 77).

From the AFL's perspective, the completion of the customary gift of food to the iroij would be a shining example of ri-Roñļap "taking charge of their lives again" and the continuity of human-ecological practice uninterrupted by unfortunate past events like thermonuclear bombings (Hines 258). Kabua's account, however, shows a cultural practice that has become inhabited by the nuclear ghost: the presence of radiation haunts every step in this traditional exchange such that even when the required steps are undertaken, the meaning attached to the ceremony cannot but be changed by the historical-environmental rupture that has irrevocably altered reality for ri-M̧ajeļ. Where the AFL sees continuity, Kabua describes the rupture that the nuclear complex must disavow if they are to continue their business in the production of nuclear ghosts.

And disavow they did. When AFL returned to Roñļap after the moratorium on visits, they were delighted to find that "the eighteen months of respite from examinations and surveys apparently had permitted further restoration of attitudes and community activities characteristic of earlier years" (Hines 1962, 293). Hines's temporal construction demonstrates the

5 My analysis here resonates with Rebecca Hogue's account of the "nuclear normalizing" at work in the US's biomedical communications with ri-M̧ajeļ (2021b).

nuclear complex's investment in Roñļap: they sought to transport the reality of "earlier years" through time into the present, such that the event of the bombing and its production of nuclear hauntings is eliminated from the timeline when it comes to peoples' lived experience. A community that has survived a traumatic event and a long cohabitation with an occupying force in altered form is not enough; the community must be 'restored' to its prior state. Here we can see a variation on the transpacific process described by Erin Suzuki in which a US focus on healing Japanese hibakusha bodies worked to erase Marshallese voices "and the evidence of colonial violence enacted on their bodies [...] from emerging discourses around global nuclear power" (2021, 34); in this instance, rather than the turn to what Lisa Yoneyama has called "nuclear universalism," it is a weaponized form of cultural specificity that works to invisibilize nuclear injury and colonial responsibility in the Marshall Islands (Yoneyama 1999, 15). As with the flora and fauna of the atolls, the appearance of unaltered, uninterrupted, non-apocalyptic human life on Roñļap was a necessary alibi for the nuclear complex, one which would keep alive the idea that nuclearization could continue without responsibility for its consequences, for the ghosts that it would produce and their call for justice.

The nuclear ghost, Schwab writes, marks a "double haunting:" a "haunting from the past [...] and a haunting from the future" (Schwab 2020, 17). In the nuclear age, we are haunted by past nuclear events as well as the threat of the nuclear events to come, including the transgenerational bodily harms set into motion by the nuclear events of the past. Schwab argues that one of the most impactful results of this double nuclear haunting has been "a persistent epistemology of deceit and denial [that] causes most people to live their lives in a mode of *as if*—they live *as if* the danger of the plutonium economy were a thing of the past, or they live *as if* there still were a sustainable shared world free from the threat of nuclear annihilation" (2022, 17). The context of nuclear settler colonialism in the Marshall Islands makes this *as if* visible as itself a power relation: we may all be forced to live in the psychic state of splitting and denial indexed by the *as if*, but some of us, especially in this case the Marshallese, are forced to live in highly radiotoxic environments in order to sustain the denial and splitting of those who irradiated them. Those who live atop the Tomb, who cannot but be consciously aware of the past irradiations threatening their personal and intergenerational futures, are forbidden the work of mourning as an integral part of the colonial enterprise that forces them to live there in the first place. The exorcism of the nuclear ghost is central to the ongoing operations of the nuclear complex, which enacts its own distance from nuclear haunting by forcing colonized and formerly

colonized peoples into intimacy with it. Reckoning with the nuclear ghost, doing the work of mourning, thus becomes not solely an act of historical responsibility for those engaged in nuclear colonialism, but also an important aspect of nuclear decolonization.

Resignifying the Tomb

The work of mourning as an act of nuclear decolonization is foregrounded in a recent work by Kathy Jetñil-Kijiner, a Marshallese poet and activist whose spoken and written works have done a great deal to bring the entwined realities of nuclearization, climate change, and colonialism in the Marshall Islands to a global audience. The Marshall Islands' most well-known contemporary artist, Jetñil-Kijiner rose to global prominence after performing her poem "Dear Matafele Peinem" at the 2014 UN Climate Summit. She went on to publish the first book of poetry by a Marshallese author, *Iep Jāltok: Poems from a Marshallese Daughter*, in 2017, as well as cofounding the environmental and climate justice organization Jo-Jikum. In *Anointed* (2018), Jetñil-Kijiner, in collaboration with photographer Dan Lin, returns to the nuclear histories that she first addressed in purely written form in *Iep Jāltok*. Through the tensions and rifts between the oral, aural, written, and visual components of representation made possible by the video poem as a form, Jetñil-Kijiner approaches the Tomb and the nuclear ghost from a position grounded in the historical, spatial, and epistemological specificities of the Marshall Islands, revealing the ongoing nature of the harm obscured by the processes of denial and splitting imposed by nuclear settler colonialism while also insisting on the possibility of a decolonized relationship to that harm. In *Anointed*, the nuclear ghost's capacity to call for justice is restored through the reincorporation of the ghost itself into Marshallese lifeways.

Anointed opens with a black screen displaying the words "After WWII the United States tested 67 nuclear weapons in the Marshall Islands" (Jetñil-Kijiner and Lin 2018). The sound of the ocean plays over the dark screen and the small white text, attuning the sensorium of the viewer to an aural register that is shaped by the ocean and challenging the authority and ability of the Anglophone written word on the screen to capture the reality of Marshallese experience. While the poem is in English (and Jetñil-Kijiner has written with sorrow elsewhere of her limited fluency in Marshallese), the opening frames thus evoke the difference between Marshallese and Western conceptions of the relationship between language and the natural world. In Marshallese vocalized morphemes are imagined as

capturing the reality of the environment in sounds, in contrast to Western languages that are imagined as arbitrary sounds that mediate the world without being inherently connected to it; in Marshallese, "voices pick up the sounds of the environment and persons retain their environment and lineage by voicing Marshallese sounds properly" (Schwartz 2016, 8). In *Anointed* the ocean is the voice that first speaks, offering an unabstracted voice and a representation of the world in which the Pacific is a live and active storyteller of its own narrative even as that narrative has been written over by the history of nuclear testing as shown in the written text.

Like the "radiation language" described by Barker (2004, chapter 6), in which new terms and phrasings to describe the experience of nuclearization are developed in Marshallese as an act of resistance to the interpretations of the nuclear experience imposed on ri-M̧ajeļ in English, Jetñil-Kijiner's foregrounding of the voice of the ocean itself rejects Anglophone nuclear-colonial epistemologies and centers the ocean as a site of meaning-making. Nature ceases to be that which exorcises the ghost, an object manufactured by the US whose continuity will absolve the nuclear colonizer of any responsibility for the harm committed. It becomes instead a speaking voice and source of authority within a Marshallese epistemology, capable of carrying its own truth about histories of nuclear harm and speaking back to the erasure of historical harm. Invisible yet audible, the ocean embodies the nuclear ghost that the West's best efforts have failed to exorcise — and the demand for justice that, like the ghost itself, refuses to pass on.

In the following sequence, *Anointed* models a Marshallese approach to the nuclear ghost haunting the oceanscape. At the beginning of the poem proper, the extradiegetic sound of the ocean becomes an intradiegetic sound as the first visual shot of the film appears (Figure 2).

Figure 2: Jetñil-Kijiner and Lin, "Anointed." 00:15.

The shot is filmed from eye height from the middle of an outrigger canoe looking out across the open prow; no other people on the ship are visible, but we can see the sail, the rigging, the sky, the wave patterns, and the way that the canoe is moving across them. The shot thus places us in the position of the helmsman during a long ocean voyage, the one who "had to keep his eyes on the riggings, the stars, the wave patterns, and the weather signs while others slept in relative comfort" (Stone et al. 2000, 4). This placing evokes the Marshallese term *juumummej*, which translates to 'stand awake.' According to Donna K. Stone, Kinuko Kowata, and Bernice Joash, "Marshallese use this in circumstances requiring concentration, alertness and a sense of responsibility for the welfare of others" (4). Placed in the position of the navigator of the outrigger canoe, a position and a technology that is central to Marshallese cultural identity and a cultural resurgence of place and sovereignty on the ocean (Genz 2018), the viewer is interpellated within a Marshallese world where history, cosmology, place, and epistemology come together to call forth what will be necessary to approach Runit: focus, attention, and "a sense of responsibility for the welfare of others" (Stone et al. 4). Just as the previous sequence differentiated Marshallese conceptions of sound, land, and meaning from those of the West, so this shot distinguishes a Native Pacific approach to Runit defined by care and responsibility from the nuclear complex's approach to the atolls defined by appropriation, exploitation, and human suffering. While the words of the poem are marked by a sense of destruction and loss: ("Will I find an island / or a tomb?" [Jetñil-Kijiner and Lin]), the visual language of the canoe journey establishes a Marshallese framework of care within which this loss will be incorporated.

This disjunction between the words of the poem and the aural and visual components of the film continues throughout the text, building a layered, shifting, and sometimes contradictory aesthetic that captures the complex histories and dialogic presents of life in the nuclear contact zone. While some textual moments match the mood and content of the sound and visuals (as when Jetñil-Kijiner narrates the legendary burning of a village after a child is given a smoldering brand by Letao accompanied by visuals of detonations at the Pacific Proving Ground and the roaring sound of the bombs), the text of the poem tends to offer a darker and less mutable reality than that proposed by the film. Early in the poem, for instance, Jetñil-Kijiner speaks the lines: "There will be no white stones to scatter around this grave. There will be no songs to sing" over the image of an empty woven basket. And yet, as the film progresses, we see Jetñil-Kijiner conduct the ritual of placing white stones on the "grave" of the Runit Dome (Figure 3), and after the end of the poem the film continues

for almost another minute and a half with the instrumental sound that underscores the end of the poem giving way to footage of the ri-Runit songwriter Helina Kaiko singing "A Song for Runit" beneath written information about the present state of Runit, the Treaty on the Prohibition of Nuclear Weapons, and the film's credits. English, the language of nuclear colonial occupation, is thus associated with claims about how things will unchangeably go, while the images and sounds of ri-M̧ajeļ honoring Runit contradict these futural foreclosures.

Figure 3: Jetñil-Kijiner and Lin, "Anointed." 03:36.

With this tension between the language of the poem and the images and sounds of the film, Jetñil-Kijiner and Lin challenge the inflexibility of signification imposed on the Marshall Islands by the settler colonial nuclear complex. For the nuclear complex, as we saw with the repatriation of the ri-Roñļap, the power to fix land, ocean, and people in time and space and determine what they would mean was a crucial part of nuclear colonialism. It was this power over signification that both demanded the return to Roñļap and insisted that this return meant that it was possible to continue "as usual" after a thermonuclear bombing. In the poem, the Runit Dome, itself, comes to stand in for this fixed historico-spatial signification: "Plutonium ground into a concrete slurry filled your hollow cavern. You became tomb. You became concrete shell. You became solidified history, immoveable, unforgettable."

And yet *Anointed* establishes a more active and more flexible relationship to this "immoveable, unforgettable" history site for ri-M̧ajeļ, asking "How shall we remember you?" to suggest that how the Runit Dome will become incorporated into the stories that compose Marshallese concep-

tions of the world is still an open question (Jetñil-Kijiner and Lin). The tensions and contradictions between the poem's verbal, visual, and aural languages also work to hold this question open, suggesting the inability of nuclear settler colonialism to maintain its signifying power over the Marshallese oceanscape even as the Runit Dome stands as an eternal monument to its attempts to do so. The nuclear colonial processes of denial and splitting demand that the world be fixed as a singular 'as if,' removed from the multiplicity and ongoingness of Indigenous worldmaking processes. *Anointed* reclaims Runit as a site that is still open to relation, to being part of a Marshallese world. The nuclear ghost that haunts the Tomb is rendered apprehensible, no longer disguised by the stunning natural beauty of the atoll. And yet unlike in the USian (nuclear) gothic, where the past is "something lapsed or outlived," the ghost is not brought into sight merely to dispel it, to consign it to the past where it belongs (Fiedler 1960, 115). Rather, the tomb becomes a site of mourning within a Marshallese epistemology where the dead become not ghosts, but ancestor-spirits.

At the launch of *Anointed* at da Shop bookstore in Hawai'i, Jetñil-Kijiner and Lin described approaching the Runit Dome as like "visiting a sick relative you never met" (Frain 2018). This approach situates the dome within Marshallese epistemologies in which "land is the lifeblood of the people; it is treated as a family member, and it is sacred and represents the living spirits of both the ancestors who took care of it and future generations that will continue the synergistic relationship" (Barker 2019, 366). *Anointed* does not pretend that Runit is well, but nor does it treat damaged land as disposable or consign it to the past. Rather, the oceanscape of Runit is treated as a "sick relative," an irreplaceable individual whose illness is real and whose sickness imposes a responsibility of care upon you as a family member. In Marshallese ghost theory, ancestor-spirits are inherently locational such that environments become ancestral as they become hosts to the non-corporeal past (Carucci 2019, 46). Treating the contaminated oceanscape as an ancestor-spirit thus incorporates the irradiated atoll into Marshallese kinship structures: no longer a rupture of Marshallese lifeways, but something that can be incorporated into the continuity of Marshallese life. As Aimee Bahng writes of the poem, "there can be healing to remember beyond death" (2020, 62). The leaking Tomb demands not, or not only, better sealing and containment to exorcise more completely the leakage of the past into the present. Rather, the Tomb and its ghosts require the work of mourning: the gathering of white stones into the basket, the scattering of stones upon the grave. In performing these rituals for the Tomb, rituals that are traditionally performed on the graves of the ancestors in order to maintain the connection between the past and the

present, Jetñil-Kijiner resignifies the nuclear ghost as an ancestor-spirit whose relationality must be respected; a relation that might be improved, but that should not be severed.[6]

Anointed thus radically transforms the temporality through which the nuclear complex is able to imagine the nuclear ghost as something exorcised, something confined to the past. For the nuclear complex, time is linear and the past is unreachable; it is the ideal Tomb, where what is forgotten can truly be lost. The narrative energy of the nuclear gothic comes from the fear of the return of the repressed, that this temporal containment might fail. In *Anointed,* however, Jetñil-Kijiner models a very different relationship to the nuclear past. When Jetñil-Kijiner addresses the island, asking "who remembers you beyond your death?" (2018), the film presents the answer (figure 4): it is the people of the island who remember.

Figure 4: Jetñil-Kijiner and Lin, "Anointed." 02:27.

The poem collapses the time of loss, of absence, and the time of the now, of presence. There are moments where this collapse is more aligned with traditional notions of the nuclear uncanny and the vengeful ghost, as when the camera lingers on a ri-Runit woman's deformed hands while the narrator cites the linear temporality of the exorcised ghost promised by the nuclear scientists: "*It's not radioactive anymore / Your illnesses are normal / You're fine. / You're fine*" (italics original). More frequently, though, the presence evoked by the film defines a Marshallese time of what Gerald Vizenor calls survivance (2010): the ongoing reality of a Marshallese sovereignty that stands against loss, as when over the narrator's descriptions of that which has been lost—"[y]ou were a whole island, once. You were

6 For the connection to ancestors through the grave ritual see Barker (2004, 70–71). Carucci discusses how non-corporeal spirits are to be worked around rather than exorcised in the Marshall Islands (2019).

breadfruit trees heavy with green globes of fruit whispering promises of massive canoes" — the camera shows those heavy fruits in the present, shows Marshallese children embraced by the ocean, shows the canoe. The ongoing power of the past to harm the present is a truth, and a bad one. But *Anointed* insists that it is not the only way that the past continues into the present. Marshallese sovereignty and relatedness to the oceanscape also figures the co-presence of past and present, and it is by developing a sovereign kinship relationship to the past — not by adopting the Western logic of the past's disposability and the nuclear gothic's figuring of the past as fearful revenant — that the film imagines the creation of an ongoing Marshallese world.

Anointed's process of production also serves as a practical example of how a resignified, decolonized relationship with the past can provide a framework and opportunity for building a decolonized Marshallese lifeworld. At the launch of *Anointed*, Jetñil-Kijiner and Lin described how "the voyage included community discussions with elders and a writing workshop with the youth. Since the story of the dome is not usually a 'happy one' the gatherings and workshops served as a method for the people to tell their stories not covered in the media or reported in US government documents" (Frain 2018). *Anointed* is a work written in collaboration with and in relation to both Runit Island and the people of Runit. In this way it counts as a form of Marshallese knowledge, which is formed from *jitdam kapeel*, "an intricate understanding of these connections and relationships — of the spaces that connect people in complex and overlapping genealogies and social hierarchies" (La Briola 2006, 12). Within jitdam kapeel, the world is a web of persons in relation to each other — persons including people, islands, lagoons, and oceans — not only synchronically, but also diachronically, as the importance of genealogy builds a world composed of social webs that stretch backwards and forwards across time.

Where the nuclear complex seeks to create nuclear ghosts in perpetuity on the assumption that it can then consign them to the past, then, *Anointed* emerges from and works to perpetuate a world that, while haunted by the nuclear ghost, refuses to render it disposable. As a spoken word event, the poem participates in a long tradition of oral performance in the Native Pacific that is designed to "establish an actively dialogical relationship with the audience;" to facilitate "intersubjective relationships" which, as Michelle Keown emphasizes, "can involve the dead as well as the living" (2018, 40). In its collectivity and its approach to Runit, including the Tomb, as a relative, it insists that even an oceanscape that has been seeded with nuclear ghosts can be decolonized, can be a space for what

ri-M̧ajeļ call *ippān doon*, togetherness across time as a practice of survival and freedom (Schwartz 2012, 12). In *Anointed*, we see figures of isolation such as Jetñil-Kijiner standing alone on top of the Runit Dome. But we also see Jetñil-Kijiner recuperating the dome as a space of ippān doon by conducting the graveside ritual with which one would mourn a relative, rejecting the nuclear complex's logic of containment and its use of splitting as a psychic fixative, and reincorporating it into the relational web of the Marshallese world.

As I have argued in relation to Māori nuclear kinship, to claim a kinship relation to nuclear things is to claim a sovereign relation to them that stands in opposition to colonial powers' attempts to appropriate nuclear as well as other forms of sovereignty to themselves (Hurley 2018, 33). Kinship is a sovereign mode of social-environmental organization that, as Jeffrey Sissons has argued, "provides a foundation for cultural resistance to the rational operation of state power" (2005, 33). As such, reframing the nuclear ghost through the lens of kinship serves to actualize an Indigenous reality against the imposed reality of nuclear settler colonialism. Across the Pacific, Indigenous writers from Jetñil-Kijiner to the Māori author James George to the Chamoru poet Craig Santos Perez and the Native Hawaiian novelist Kiana Davenport have used their writing to incorporate nuclear things into Indigenous kinship structures, storying the world anew to build an alternative world within which nuclearization can be understood as part of Indigenous lifeways. As a form of antinuclear worldmaking, the assertion of kinship with haunted nuclearized environments serves as what Sasha Davis has defined as "a form of activism bent not just on rhetorically challenging power but also on territorializing an alternative regime of power in space" (2020, 47); as Erica Violet Lee (Cree) writes of taking up the responsibility of care for wastelanded landscapes and bodies: "It is here I understand that love and law are one and the same" (Lee 2016). Caring for the nuclear ghost as a sick relative, as Jetñil-Kijiner frames it in *Anointed*, is both an act of love and law, love *as* law, a law that stakes its own claim to the irradiated lands and waters of the Marshall Islands and that in so doing enacts a process of nuclear decolonization.

Through its recomposition of relations with the nuclear ghost as ancestor-spirit, *Anointed* recreates the Tomb as a place where Marshallese law and kinship structures are actively resurgent, countering the eliminationist settlements of nuclear settler colonialism and its attempt to exorcise the nuclear ghost with vibrant and ongoing practices of Native Pacific sovereignty. As I write, the US is, once again, refusing to honor its ongoing responsibility for the ongoing harms of nuclear testing in the

Marshall Islands by claiming a strict division between the past and what comes after it, repeating its assertion that the (extremely limited and as yet unfulfilled) compensation scheme set up in the Compact of Free Association between the US and the Marshall Islands settled "all claims, past, present, and future" that might be made by the lingering presence of what we are calling here the nuclear ghost (Kyodo News 2022). The assertion of the ongoing, relational presence of the nuclear ghost not only counters such a claim, but does so within a decolonial framework that insists on the vibrancy and power of Marshallese sovereignty and its capacity to claim justice. In *Anointed*, as in Marshallese struggles for nuclear justice more generally, the work of mourning, banned for so long by the nuclear complex as it sought to expel the harm of thermonuclear bombing from consciousness, becomes an ongoing relationship with the past that provides the ground, like other ancestors, on which a future might be built. Fusing their antinuclear decolonial critique with their ongoing care for the Tomb, Jetñil-Kijiner, Lin, and the people of Runit turn to the desperate call of *Anointed*'s lyrical 'I'—"[t]here must be more to this than incinerated trees, a cracked dome, a rising sea, a leaking nuclear waste with no fence, there must be more than a concrete shell that houses death" (2018)—and answer: *there is. There is.*

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Atomic Totem: Australian Settler Nuclearism, the Disavowal of Aboriginality, and Morbid Reconciliation

Abstract: Although the actual welfare of nearby Aṉangu populations was so clearly disregarded throughout the period of British nuclear testing in South Australia in the 1950s and 60s, curiously, the aesthetics of the nuclear testing project itself were awash with Aboriginal-derived symbolism, imagery, and language. From the names of testing sites and operations, to the declaration by a member of the surveying crew to the media that a mushroom cloud was "a perfect portrait of a myall blackfeller written with atomic dust," the nuclear testing was repeatedly associated with Aboriginality. This was not a practice unique to Australia; as Jessica Hurley notes, other nuclear-armed nations shared this "compulsion to name nuclear laboratories and technologies after [Indigenous] nations, practices and spaces" (2018, 97). In this essay, I draw on a range of textual sources — a memoir by government surveyor and raconteur Len Beadell, as well as less traditionally 'literary' texts (such as place-naming practices) — to examine the ways in which this appropriative act points to a complex process of disavowal that takes place in the settler imaginary. Focusing on the mid-century Australian context, I find that where the existential anxieties of the nuclear age meet the unconfronted violence and dispossession of colonialism, confused and uncanny visions arise; partial acknowledgements of the primacy of First Nations' claims to country arise in the moment at which all the possibilities of nuclearism — megadeath, the new atomic potential for massive violence and destruction — are also present. In this field, a strange and morbid vision of settler/Indigenous reconciliation emerges from the settler cultural imaginary.

Keywords: British nuclear testing in Australia; disavowal; totemism; nuclearism; settler imaginary; reconciliation.

Introduction: First Nations People and the British Nuclear Testing Program in Australia

As tensions escalated along Europe's Iron Curtain at the onset of the Cold War, the United Kingdom sought to consolidate its position in the nuclear arms race with the Soviet Union. Denied access to testing grounds in the United States after an instance of espionage in the Manhattan Project damaged the alliance between the two nations, the UK began to turn to its colonies in search of land to host its own nuclear weapons testing program (Tynan 2016, 4–7). From 1952 to 1963, the British government tested plutonium bombs, nuclear warheads, and other devices on Australian territory; firstly, at the Monte Bello Islands off the coast of Western Australia, and subsequently at Emu Field and Maralinga, two sites in the Great Victoria Desert in South Australia. This arrangement was made possible by the strangely unquestioning compliance of Australian prime minister Robert Menzies, who hoped to secure a proxy position for Australia in the Cold War arms race; however, in the end Australia did not even benefit from the scientific knowledge the tests afforded, much of which Britain retained (Tynan 2016, 4). Operations ceased in 1963, and in 1968, after a series of clean-up operations which science historian Elizabeth Tynan (2016) has described as "lazy," (231) "cursory," (237) and "inadequate," (244) Britain reached an agreement with Australia to sign away its responsibilities to the testing sites.

However, the political fallout from the testing continued. In the mid-seventies, a group of nuclear veterans began to make allegations about veteran deaths and disease which resulted in media attention and public criticism (Cross and Hudson 2005). Several years later, in the wake of activism by leaders from affected Aboriginal communities such as Yankunytjatjara man Yami Lester, and after a follow-up investigation in which millions of fragments of radioactive plutonium were discovered still present in the soil at Maralinga, the Australian government announced a Royal Commission into British nuclear testing in Australia (Tynan 2016). The characterisation of the nuclear testing project in the report of the 1985 Royal Commission relied on a vocabulary of failure and inadequacy, describing the performance of the government as "unsatisfactory," (Royal Commission 1985a, 11) "dangerous," "negligent," (15), and "deceitful" (9). The Commission found that the public "was not informed of the true nature of the hazards involved," (9) and given that fallout from the major trials spread variously across the continent, they argued that it was "probable that cancers which would not otherwise have occurred have been caused in the Australian population" (15). The whole episode was inexplicably marked by

shameful political failures, instances of dangerous ineptitude and avoidance, and an apparent shocking willingness on behalf of the government to expose the greater Australian population to risk of harm.

The British nuclear testing in Australia had particularly dire consequences for local Aboriginal populations, consisting primarily of Aṉangu (Ngaanyatjarra, Pitjantjatjara, and Yankunytjatjara) people, whose "distinctive lifestyle" made them "specially vulnerable" to its hazardous effects (Royal Commission 1985a, 16). Although some efforts were made to notify Aboriginal communities in the vicinity of the test sites, notably by a poorly resourced 'native patrol officer', some Aboriginal people were still unaware that the testing was taking place; as Tynan comments, "[a]mple evidence suggests […] that individuals and small groups [of Aboriginal people] walked across the lands after the tests began" (2016, 174). The Royal Commission was scathing about what it saw as the failure of the Menzies government to ensure the safety of nearby Aṉangu populations, describing it as the result of political "ignorance, incompetence and cynicism," (1985a, 20) and finding that if Aboriginal people "were not injured or killed as a result of the explosions, this is a matter of luck rather than adequate organisation, management and resources allocated to ensuring safety" (1985b, 323). Beyond the immediate dangers of exposure to radioactive fallout, however, Aṉangu people suffered a host of other major and devastating impacts — perhaps most significantly, many people were forced to relocate from their ancestral lands prior to the testing taking place, and these lands were subsequently contaminated (and may remain so for an indefinite period of time) (Tynan, 2016). These were not primary concerns for the British or Australian governments. Infamously, Department of Supply chief scientist Alan Butement responded to concerns about Aboriginal welfare with the accusation that such concerns demonstrated a "lamentable lack of balance" in "apparently placing the affairs of a handful of natives above those of the British Commonwealth of Nations" (as cited in Morton 1989, 84).

While the actual welfare of First Nations populations was so clearly disregarded throughout the nuclear testing episode, curiously, the aesthetics of the nuclear testing project itself were awash with Aboriginal-derived symbolism, imagery, and language. In the naming practices that repurposed words from disparate Aboriginal languages to designate nuclear test sites and operations, and in the imagery that populates official accounts of the testing and the testimony of various other non-Aboriginal military personnel and civilians, it seems that there was a clear — but unacknowledged — propensity to associate the nuclear testing with Aboriginality. Of course, Aboriginal imagery has long been subject to appropriation by settler Aus-

tralia for various ideological purposes; decades ago anthropologist Eric Michaels noted that "the production of Aboriginal images for mass consumption [is considered] a right, if not a responsibility, of a nation consumed with the manufacture of its own mythology," (1994, 41) and legal scholar Marcia Langton observed that "the most dense relationship" in Aboriginal affairs "is not between actual people, but between white Australians and the symbols created by their predecessors" (1993, 33). However, this appropriation of an aesthetics of Aboriginality is striking given that it occurred during an era in which Indigenous issues were almost absent from public discourse. Although this was a period of significant and fierce activism from First Nations communities, including anti-protectionist lobbying, Charles Perkins' 1965 'Freedom Rides', and pastoral walk-offs (see, for example, Attwood and Markus, 1999), in the broader political sphere there was a widespread indifference when it came to examining the settler colony's relationship with First Nations peoples. Indeed, in 1968 the anthropologist W. E. H. Stanner famously dubbed this phenomenon "the great Australian silence" (Stanner 1969, 25). Why, at a time when there was such silence about Aboriginal people in the settler political arena, was an iconography of Aboriginality apparently so important to the representation of the British nuclear testing program?

In this article, I use tools from literary and cultural studies to explore some ways in which this apparent drive to appropriate icons of Aboriginality to characterise or imagine the nuclear bomb demonstrates something about the place of the testing in the mid-century Australian settler cultural imaginary. There is, I will argue, a bleak and morbid impulse at play here. I draw on a range of textual sources—a memoir by government surveyor Len Beadell, as well as less traditionally 'literary' texts (such as place-naming practices)—to examine the ways in which this appropriative act points to a complex process of disavowal that takes place in the settler imaginary. Where the existential anxieties of the nuclear age meet the unconfronted violence and dispossession of colonialism, confused and uncanny visions arise.

Blast the Bush: Disavowing Aboriginality

One of the most detailed accounts of the first mainland nuclear tests—two plutonium bomb trials codenamed 'Totem' that took place at Emu Field in 1953—is found in a memoir by government surveyor Len Beadell.[1] A bushman, builder of roads, writer, cartoonist, and raconteur, Beadell was a key figure in the British nuclear testing project in Australia. He

1 Len Beadell is not necessarily regarded as a reliable memoirist (for instance, see Gara (2020)). *Blast the Bush* is examined here for what it reveals about discourses of Aboriginality in settler culture and its imaginary, not because the text represents an authoritative source on the historical details of the nuclear testing program.

was initially involved in surveying activity for the Long Range Weapons Establishment and the Woomera rocket range in the late 1940s, surveying tens of thousands of square kilometres of land for defence weapons testing purposes, and establishing the pathway for rocket and missile traffic known as the 'Centre-line Corridor' that stretches several thousand kilometres across central Australia. In the early 1950s, the Australian government once again enlisted Beadell's services on a classified mission to find a suitable site for nuclear weapons testing—this story of the mission to survey Emu Field and conduct the first two atomic tests on the Australian mainland is the subject of *Blast the Bush* (originally published in 1967).

The publication of *Blast the Bush* was contemporaneous with the historic 1967 constitutional referendum that sought to permit the Australian Commonwealth to make laws that applied to Aboriginal people, and to allow Aboriginal people to be counted in the census. While its legacy is complex, the referendum is still regarded by many as a notable political achievement and a precursor to the current impetus towards Indigenous constitutional recognition; Russell Taylor, for instance, CEO of the Australian Institute of Aboriginal and Torres Strait Islander Studies, has described the 1967 referendum as "the historic high point in our [Indigenous people's] relationship with the nation," and claims that First Nations people "take considerable comfort, confidence and moral strength" from its outcome (2017). In another parallel, a cornerstone of the referendum's 'yes' campaign was built around the public controversy surrounding the plight of a group of "impoverished and dispossessed" Aboriginal Wongi people in the Warburton Ranges, who had been driven off their country in preparation for the British nuclear testing at Maralinga (Attwood and Markus 2007, 15). When the Commonwealth government was petitioned with requests to intervene for the welfare of the group, it responded with the suggestion that Aboriginal welfare was a state matter. 'Yes' campaign activists went on to leverage the controversy generated by this incident to strengthen their calls for the Commonwealth government to assume greater legal and financial responsibility for Aboriginal people (16–17).

The cultural proximity of the events of 1967 goes unacknowledged in *Blast the Bush*. Indeed, as suggested by Beadell's vocabulary for the landscape—with its emphasis on openness, emptiness, and availability—the text is not concerned with Aboriginal experience at all. Living Aboriginal people do not feature in *Blast the Bush*; instead, a kind of Aboriginal absence is read into archaeological material, relics, and traces in the sand. In the opening pages, Beadell describes the requirements for the bomb site in terms of its remoteness from urban centres, declaring: "It was important that the deadly radioactive fallout be carried away harmlessly

into the desert" (1986, 9). The desert, as blank space, a site outside of the networks of causation and moral obligation, is a work of settler fantasy. As established above, Tynan notes in her authoritative history of the nuclear testing that "there could be no denying that Aboriginal people were in the vicinity" of Emu Field; they were "there for all to see, if they cared to look" (2016, 173), and there are many accounts from Aṉangu people in the surrounding region who witnessed the fallout from the Totem tests, including Jessie Lennon, Lallie Lennon, and Yami Lester (who went on to publish their witness accounts),[2] as well as the numerous Aboriginal people who subsequently gave evidence for the Royal Commission. Elsewhere in the memoir, the possibility of this Aboriginal presence is invoked and then swiftly denied; returning from a long and difficult excursion, Beadell recounts a scene in which he is met by a security officer who has been spooked by the discovery of a "bare footprint" in the sand near the testing site:

> Everyone concerned in the camp was in a near panic, convinced that some unsuspecting nomadic natives were ambling about in danger. [...] I burst out laughing. When I could speak I explained to the astonished officer that the track belonged to me (1986, 158).

The laughter here seems to be prompted by the relief of an anxiety about harming Aboriginal people, brought about with the discovery that Aboriginal people do not, after all, exist in the present; they have been pre-historicised, relocated temporally to a distant past. Later, Beadell comes across evidence of what he believes to be an ancient sacred Aboriginal site: "And this only five miles from where the first atomic bomb was to be tested in Australia! I couldn't help wondering what these long-dead tribes would have thought about it all" (102). The discovery of 'archaeological' sites like this leads Beadell to be fascinated by what he frames as the "ironic clash of old and new;" gathering shards of charcoal from an 'ancient' fire for the purposes of carbon dating, he observes that "it was by-products of this very [nuclear] weapon which could be used for determining the age of the charcoal" (176). The link between nuclear testing and carbon dating establishes this ideologically important juxtaposition between an ancient, absent Aboriginality and the modern nuclear-affiliated settler state.

Somewhat paradoxically, these scenes of Aboriginal absence coincide with a particular kind of symbolic Aboriginal presence. As recounted in *Blast the Bush*, the living and working spaces of the Emu Field test site were pervaded by icons of Aboriginality. Beadell describes a mural he painted himself along one long wall of the mess hall that features two

2 See Lennon (2000), Lennon (2010), and Lester (2000).

characters: the first "a typical Englishman wearing pince-nez glasses and wing collar" who peers "through the window at the typical Australian bush," and the second "a wild myall Aborigine" who "looked right back, laughing at all the frenzied effort going on inside" (129). The encounter depicted in this mural is clearly ideologically crucial enough to be pictured at the heart of the test site's daily activities. Likewise, Beadell recounts that William Penney, head of the British Atomic Weapons Research Establishment (AWRE), commissioned Beadell to make him a memento of the testing in the form of "a watercolour painting of an Australian Aborigine," which Penney planned to hang "among typical souvenirs of bomb trials in their official mess back in the U.K." (102); once again, the image is intended for display in a mess hall as though to ideologically orient the everyday, domestic environment that materially supports the testing program, even at its base in Britain. But perhaps the most striking and paradigmatic example of this is the metaphor in the rehearsed speech that Beadell reports was delivered by a member of Beadell's surveying crew to a small group of journalists in the moments following the initial Totem explosion; pointing to a ballooning mushroom cloud, he declares: "A perfect portrait of a myall blackfeller written with atomic dust; the new and the old have come together today" (210–11).

On one level, this 'indigenising' of the nuclear testing could be interpreted as a means of highlighting the testing's ultra-modern international imperialist agenda. Graeme Turner writes that the Australian government "seized on" the testing as a sign of "a transformed modernity, a chance to leap from an agricultural past to a technologized future in the new role of supplier to the major powers" (1993, 182). Aboriginality, perhaps, became a useful concept in this project because it had the effect (from a racist settler perspective) of emphasising, through juxtaposition, the nuclear testing's association with politically expedient qualities like modernity, futurism, and technical and scientific achievement. The need for the testing to be branded as Australian was likely also a consideration, given the Menzies government's hopes of bolstering Australia's position in the context of the Cold War arms race (of course, there are many ironies in using icons of Aboriginality for this purpose). However, taking into account my reading of this imagery's dual function — signifying at once the *absence* and *presence* of Aboriginality — I suggest that another way to understand this imagery is as a means of dealing with settler anxiety around colonial violence, as well as a way of managing an awareness that the nuclear project represents an extension of this same colonial frontier. In the simultaneous denial and acknowledgement of Aboriginality at play here, the outlines of a psychic structure like disavowal begin to assert themselves.

Disavowal is described in Freudian psychoanalytic terms as the rejection of the reality of a perception as a means of defending against its "potentially traumatic associations" (Penot 2005, 415), a "suspension of the function of judgment" to forestall the acceptance of an unbearable reality (416). It is more complex than outright denial in that it involves the simultaneous rejection and acceptance of a reality, as in the formulation "I know quite well how things are, but still…" (Kuldova 2019, 766). As many have noted, this conflicted psychic structure is a major feature of settler Australia's relationship to the First Nations people of the continent. Writer and cultural critic Ross Gibson, for instance, identifies the trademark signs of disavowal in the colony's contradictory impulses towards suppression and recognition of the frontier violence that marked the nation's colonisation, a situation that he describes in gothic terms in *Seven Versions of an Australian Badland* (2002) as "sensing but trying not to see" and "fearing and knowing but trying not to acknowledge" (111); Bob Hodge and Vijay Mishra see this same psychic structure at play in the simultaneous recognition and denial of Aboriginal claims to country, resulting in the creation of the "Aboriginal archipelago," a place "constructed on a double premise, of exclusion (by refusing to acknowledge the Aboriginal presence in society) and ubiquitous presence (so that land rights already exist in some spiritual place, and do not need to be denied)" (1991, 30). Across various cultural sites, the violence of the colonial encounter and the illegitimacy of settler occupation is consistently both invoked and denied.

My reading of Beadell's memoir suggests that the nuclear testing program became a particularly prominent site for the settler project of the disavowal of aboriginality. Where the 'Aboriginal archipelago' meets the massive potential for annihilation of the nuclear age, confused images arise; rather than acknowledge the actuality of Aboriginal presence in the vicinity of the nuclear testing, Aboriginal likenesses are painted on walls and appear in smoke, and evidence of Aboriginal occupation of the land is pre-historicised and temporally displaced. The fact that the British nuclear testing in Australia has been so poorly publicly memorialised and, at least until recent years, largely forgotten (outside of the First Nations and nuclear veteran communities who most immediately bore its impacts) is, perhaps, further evidence of this painful contortion in the national settler psyche, a symptom of psychic difficulty and obstruction. Tynan writes that, until recently, the events at Monte Bello, Emu Field and Maralinga were "a great Australian secret, barely recognised as part of this nation's history," (2016, 14) and historian and literary critic Robin Gerster writes that "looking the other way" was "Australia's version of 'Duck and Cover'" (2020, 3) (the US government Cold War child safety program that taught school-

children to hide under their desks in the event of a Russian nuclear strike). Disavowal, it would seem, is the holding pattern that grips settler Australia, where the unacknowledged contradictions of settler colonialism collide with the unacknowledged contradictions of nuclearism.

Thunder: Appropriating Aboriginality to Imagine the Bomb

Some further characteristics of this process of disavowal become apparent in the appropriation of Aboriginal language and concepts as names for some of the program's nuclear testing sites and operations. In 1953, the name 'Maralinga'—which has tended to function as an eponym for the testing program as a whole—was adopted for a new testing site several hundred kilometres to the south of Emu Field, where the majority of the mainland nuclear and other weapons trials were conducted until the program ended in 1963. It was chosen at a meeting of the Commonwealth Department of Supply several weeks after the Totem tests at Emu Field were finalised in October 1953; in the minutes of the meeting, the word is described as belonging to an unidentified Aboriginal language and is reported to mean 'thunder' (Department of Supply 1953a). How the term came to be used for this purpose is unclear. It is not a word from any dialects local to the testing site, such as Pitjantjatjara or Yankunytjatjara—the A<u>n</u>angu word for thunder is *tuuni*, and the resident A<u>n</u>angu people had never heard the word 'maralinga' (Mattingley 2016, 27). In fact, the word is probably from an extinct language called Garik spoken by a people whose country is nearly three thousand kilometres to the north of the South Australian test site: the Ilgar tribe local to the area around Port Essington on the Cobourg Peninsula across the gulf from Darwin (Tynan 2016, 2). It is not known exactly how Chief Scientist Alan Butement—the same figure who argued that concerns about Aboriginal welfare demonstrated a 'lamentable lack of balance'—came across this word, or why he decided to use it to name a nuclear test site.[3]

This appropriative act is right at home in a historical episode marked by forgetfulness and uncertainty about facts. In parallel with the more literal ongoing colonial activity of Aboriginal dispossession, the word 'maralinga' was displaced from its territory and then the history of its displacement was forgotten. This disregard for Aboriginal cultural diversity and linguistic specificity is perhaps not surprising; as Eric Michaels notes, "colonial Australian administration has always refused to recognise that there is not one Aboriginal culture but hundreds of them, as there are

3 In an email correspondence with linguist David Nash, (Dec 2022) he suggested that Butement most likely came across the word 'maralinga' in H. M. Cooper's *Australian Aboriginal words and their meanings* (South Australian Museum, 1949), accessible at: https://viewer.slv.vic.gov.au/?entity=IE2184326&file=FL17572974&mode=browse.

hundreds of distinct languages, all insistently autonomous" (1994, 150). For all that it speaks to the same cognitive murkiness and lack of clarity that plagued the testing project as a whole, however, the choice of this name does seem to have been an intentional decision and, indeed, an aesthetic decision. A confidential 1953 memorandum from the Department of Supply notes: "Maralinga corresponds to the name 'Woomera' for the L. R. W. E. [Long Range Weapons Establishment] Range" (Department of Supply 1953b). Woomera is an Anglicisation of the word *wumara* from the language of the Dharug people from the Sydney basin, the name for an implement used to throw spears (*Macquarie Dictionary* 2021); the word was similarly imported and appropriated to name the town that served as the administrative base for the Australian government's long-range weapons testing program. In noting that 'Woomera' corresponds to 'Maralinga,' the minutes reveal a deliberate attempt to set up patterns of resonant meaning. Examining the appropriative naming practices connected with the nuclear testing and approaching them with the tools of textual analysis allows the content of an ideological program to emerge: a program that continues the work of *Blast the Bush* and its disavowal of Aboriginality in such a way that the end point of the logic of settler nuclearism is exposed.

There is a long history in settler Australia of the appropriation of Aboriginal words as names for sites of settlement, written about extensively by Paul Carter in his study of the geo-spatial poetics of settlement, *The Road to Botany Bay* (1987). Carter situates settler place-naming practices in an early colonial environment in which there was deep ambivalence about the relationship of (the English) language to the Australian landscape, and where there was an anxiety that "in Australia, the laws of association seemed to be suspended," leading to the terrifying proposition that "nothing [...] could be accurately named" (42). The appropriation by settlers of imported, misheard, or inaccurately rendered Aboriginal words as place names, Carter writes, is an attempt to mitigate this ambivalence; the act has the quality of a pun, a "quotation which concealed its origins, a name which cancelled out any traditions attached to it[;] [...] it functioned magically to found a new place" (329). In the mis/use of Aboriginal words as place names, settlers were at once erasing a local and living Aboriginal presence at the same time as they appropriated a sense of legitimate belonging from the more generalised aesthetic of Aboriginality. Ultimately, the word without a known referent other than its vague sense of Aboriginality functioned primarily to refer back to the act of naming, and thus to the naming settler himself:

> In order to speak, place names had to be stripped of their meaning, reduced to mere sounds. If they could be translated, the purportedly aboriginal place names of the early maps might reveal themselves as nothing more than figures of speech for the act of naming, the names of what cannot be said (330).

In the bureaucratic decision to name a South Australian nuclear testing site using a word plucked from an extinct far northern Indigenous language, there is something of the same aesthetic logic at work. If it had even been thinkable, the use of a local Pitjantjatjara or Yankunytjatjara word to name the site might have made the possibility of Aṉangu endurance—potential victims of radioactive fallout, potential traditional owners—too literal for comfort. 'Maralinga' was a word meaningless to local Aṉangu people, but which still carried connotations of Aboriginality; stripped of its specificity but still accompanied by implications of prior belonging and legitimate occupation (implications which were, outside of the symbolic sphere, unrecognised), the word could be repurposed as a way of marking a site that was both Australian and a 'new place,' the name for something that 'cannot be said;' a testing place, a site central to the security of Australia's position in the transnational nuclear war games, a parcel of home territory specially designated for nuclear destruction.

Other scholarship has recognised that the appropriation of Indigenous words in colonial naming practices has a particular significance in the context of international nuclear colonialism. For literary studies scholar Jessica Hurley (2018), this appropriative naming practice is a sign that the colonial nuclear testing endeavour has disavowed its relationships with its Indigenous others not only for a refusal to fully recognise the violence of that relationship, but also because the relationship might be more intimate than it can bear. Writing from the context of the United States' nuclear testing in the Pacific, Hurley argues that the quantum logics of nuclear science uncannily resemble Indigenous ways of understanding time, space, and the subject, and that it is this correspondence that nuclear-armed settler colonies seek to disavow with the appropriation of Indigenous language and imagery:

> The compulsion to name nuclear laboratories and technologies after Native American nations, practices and spaces [...] marks the irruption of supposedly repressed Indigenous epistemologies into the heart of colonial science. [It] is a symptom of the profound yet disavowed affiliation between nuclear and Native epistemologies even as the bulk of nuclear violence is visited upon Native peoples. In events like Opera-

> tion Redwing (1956), the West sublimates its own discomfort with the overlap between nuclear and Native epistemologies by naming bombs after Native nations in the Americas and then using them to obliterate contemporary Native Pacific Islander spaces [...] in tests designed to move the nuclear from the realm of the Indigenous uncanny into the realm of Western data (2018, 97).

In this paper, Hurley suggests that there is something animistic in the agent-like behaviour of nuclear materials; when considered alongside the quantum confusion of the laws of cause-and-effect (for example, in the 'spooky action at a distance' of quantum entanglement), this poses a major contradiction to Western logics of both the exceptionalism of human agency and of linear temporality. Nuclear materials appear to inhabit a vastly extended timescale; with their radioactive half-life, their influence extends many tens of thousands of years into the future, and they have a capacity to seemingly create effects proleptically, before they have been introduced as a cause (as in the eerie *bukimi* phenomenon that preceded the bombing of Hiroshima).[4] For Hurley, these properties align nuclear physics with Native worldviews and epistemologies that attribute agency to non-human beings and matter, that recognise channels of causation distinct from that of cause and effect, and that understand time in ways that differ from eschatological Western models, including so-called 'spiralic time' (see Hurley 2017). This means that nuclear physics is the basis for the twentieth-century world powers' imperialist ambitions, Hurley argues, at the same time as it is a profound challenge to the rationalist epistemologies that the West is otherwise so dependent upon.

Whether Australian First Nations cultures, as a whole, can properly be described as animist, or whether 'spiralic time' specifically is an applicable concept to describe Australian Indigenous ways of experiencing temporality, is perhaps difficult to assert; as Eric Michaels argued above, making generalisations about the hundreds of distinctive Australian Aboriginal cultures is, to say the least, problematic. However, some First Nations people have articulated Aboriginal philosophical positions that certainly seem roughly coincident with Hurley's characterisation above; Palyku scholars Ambelin Kwaymullina and Blaze Kwaymullina, for instance, have written on Aboriginal understandings of the "relativity and dynamism of time and space" in a way that stresses the centrality of intensive networks of interrelationship to Aboriginal epistemologies and models of subjectivity (2010, 202); they go on to claim that for Aboriginal cultures, time "is relative to the enduring physical and metaphysical context of country" (199) and constitutes a "pull of relationships moving in dynamic interaction"

4 See Saint-Amour (2000); for more on the strange temporality of nuclear materials see Masco (2006).

(200) rather than an absolute principle that manifests in a linear progression of events. Likewise, anthropologist Deborah Bird Rose has written on forms of Aboriginal animism that she identifies as ecological ontologies, in which networks of "mutual life-giving" relationships network human and non-human agents (2017, 496). Perhaps the British nuclear testing program in Australia appropriates an aesthetics of Aboriginality not only in an attempt to avoid the contradictions of its own implication in the ongoing violence of settlement (here appearing in its new nuclear iteration), but also to disallow the prospect that its relationship with the Indigenous Other might be more complicated than a dichotomy. If Indigenous epistemologies resemble nuclear epistemologies, what might that mean for colonial sovereignty?

Totem: Kinship in Apocalypse and Morbid Reconciliation

Perhaps there is a yet more basic equivalence that is being disavowed here, however. The use of the operational name 'Totem' in connection with the two plutonium bomb tests held at Emu Field suggests some further dimensions to this process of disavowal. Totem is another word that was transliterated from an Indigenous language — in this case, the language of the Algonquian group of Native American peoples (*Macquarie Dictionary*) — and has been used to describe forms of "multispecies kin groups" in Aboriginal cultures (Rose 2017, 496). Anthropologist W. E. H. Stanner described totemism in the 1970s more fully as "a belief that all living people, clan by clan, or lineage by lineage, were linked patrilineally with ancestral beings by inherent and imperishable bonds through territories and totems which were either the handiwork or parts of the continuing being of the ancestors themselves" (as cited in Williams 2008, 382). Australian Aboriginal Arrernte elder Margaret Kemarre Turner has characterised totemism as follows:

> Animals and other Species are in the kinship too. These come from our Land, and they're what our 'totem' is, as English calls it. And what those kids call that Species is by their grandfather, or their mother, or their father's father, or their mother's father. That's how we relate (2010, 9).

The adoption of this word by the British authorities as the name for the two Emu Field plutonium bomb trials (which were initially referred to in public as 'Operation X200,' or as 'Woomera' or 'Emu' tests) (Tynan

2022, 188–212) is another chapter in a story muddied by misremembrance and additionally obscured by layers of government classification and censorship. Its usage in this context is tinged with more than a little irony, especially considering that government agents were known to remove ritual objects, including 'totem poles,' from sacred places near testing sites in an effort to deter Aṉangu people from visiting their ancestral country (Tynan 2016, 182). Most pertinently, however, the naming of this test site has the primary effect of invoking totemism, as an Aboriginal way of organising and ritualising relationships—including ancestral relationships that network human and non-human subjects—in connection with the nuclear testing event at Emu Field.

What does this symbolic association between Indigenous ancestral kinship networks and nuclear imperial ambition signify for the settler cultural imaginary? The purpose of the Totem series was to conduct testing of atomic plutonium devices that were compact enough to be deployed on planes, and that had been produced using cheaper mass production methods relative to previous devices (Tynan 2016, 74). One juxtaposition that emerges here places the principles of mid-century post-war Fordist economics (with the emphasis on the device's transportability, cheapness, adaptability, and ease of replicability) side by side with the Aboriginal cultural emphasis on the endurance and inalienability of ancient lines of lineage that network human sociality to non-human kin and country, and of the social, legal, and epistemological restrictions and rigidity that surround the maintenance of the connections to this lineage. Aboriginality and Western modernity are once again organised into a dichotomous relationship, with implications along the lines of the 'Stone Age meets the Atomic Age' trope that Beadell was reliant upon; the significance of atomic weaponry here as a marker of racial, civilisational, and national identity recalls Arundhati Roy's formulation of nuclear weaponry as "the ultimate colonizer" and "the heart of whiteness" (2002, 11; see also Paul Williams 2011). This reading, too, invokes the racist and colonialist roots of totemism as a psychoanalytic concept; referencing nineteenth-century anthropologist James G. Frazer's account of Australian Aboriginal cultural practices, Freud's original study conceived of totemism as the characteristic of a 'primitive' stage of psychic development (Freud 2001 [1913]; see also Swartz 2023).

However, a further implication of this naming act (reinforced by the consonance between the words 'atom' and 'totem') is the atomic device's own status as a totemic object. The bomb is an object of extraordinary cultural, symbolic, and mythic meaning; indeed, according to nuclear anthropologist Joseph Masco, given that the principal usage of the nuclear

weapon is (in theory) as a tactical deterrent rather than an eventuality, its “primary modality is psychological and cultural” (as cited in Maguire 2013, 392). Since its power lies in its threatened rather than its actual use, the nuclear weapon is ripe for investment with all kinds of social fears and symbolism, meaning that nuclear weaponry becomes “an unprecedented tool for psychological and emotional engineering,” and “a highly overdetermined form that takes on a fetishistic structure” (Maguire 2013, 392). In the Australian context, as mentioned earlier, the nuclear weapon was of great symbolic import to nationalist agendas and foundational to the nation’s sense of security and international standing in the mid-twentieth-century global political climate; Masco suggests that symbolic investments like these have charged the bomb with potent cultural significance in a way that likens it to a fetish object. Fetishism and totemism are concepts which overlap somewhat and the terms are occasionally used almost interchangeably, given that both describe similar forms of object relations (see, for example, Worrell and Krier 2018); furthermore, like totemism, the concept of fetishism emerged from the colonialist and racist frameworks of early psychoanalytic theory, which framed the attribution of power and agency to objects as a remnant and primitive phase of psychic development (Swartz 2023).[5] But, while the fetish is broadly understood as an object that invites reverence or desire because it is a materialisation of some form of symbolic or divine power, the emphasis in totemism is on the totemic object’s capacity to structure relationships around itself, to designate kin groups and ancestors — as Margaret Kemarre Turner puts it above, the totem has something to do with ‘how we relate.’ Perhaps, in this case, the bomb is not only an objectification of a range of social fears and hopes, but is also being positioned as the organiser of a kinship network. In other words, in the settler imaginary, *the totem of the atomic bomb binds First Nations and settler Australians together in a kin-like relationship*. But the totem in this instance is also the device that has, as its defining feature, the capacity to extinguish both cultures indiscriminately — and if this is the case, the kind of relationship that the nuclear weapon seems to embody is one of mutual annihilation: a kinship of apocalypse.

This acknowledgement of cognation, bleak as it is, is surprising when considered in the context of the cultural environment that supported the British nuclear testing project in Australia. As explored earlier, an important feature of the ideology of the nuclear testing project was the contrast it delineated between an ancient, ‘long-gone’ Aboriginality and the powerfully hyper-modern nuclear-affiliated Australian state; the affinity between these two cultures that is hiding here in plain sight is

5 Although there is not space to consider this in detail here, the racist/colonialist roots of the psychoanalytic concepts of totemism and fetishism (as outlined in Swartz 2023 and in Anderson, Jenson, and Keller 2011) are an important dimension of this process of appropriation and disavowal, adding another layer of complexity. A more extended treatment of this line of enquiry is warranted.

obviously a contradiction to this ideological position. What are the features of this disavowed kinship—what kinds of affiliation are being both underscored and denied here? To begin with, the atomic totem seems to highlight some parallels that are apparent between the West's confrontation with a new sense of mortality brought about in the nuclear era, and the confrontation with mass death that Indigenous peoples across the world have already faced (and continue to face). Scholarship on the aesthetics of the nuclear age notes that following the events of Hiroshima and the global threat of the Cold War, "the nature and scope of death" underwent a "fundamental and irrevocable shift" in the West; the paradigm of the nuclear age was a "sense of terminalism and a permanent encounter with irrational, grotesque and profoundly unacceptable death" (James 1994). This was new—it severed cultures of modernity from their sense of immortality—the assumption of the continuation of culture and meaning. In some visual representations of the atomic bomb, such as in paintings by Australian artist Arthur Boyd, there is a particular attention to the intensity of the light and heat of the bomb, signalling its capacity for 'atomisation,' or complete disintegration; the result is a kind of extreme bleaching and harrowing of the subject (James 1994). These fears of cultural terminalism and the disintegration of the subject, I suggest, may have invoked in the settler imaginary an imagined affinity with the mass death, displacement and disruption visited on Aboriginal peoples under colonisation. While Indigenous ontologies themselves do not necessarily recognise self-extinction—as First Nations legal scholar Irene Watson writes, "there is no principle within Aboriginal jurisprudence which enables extinguishment" (2022, 357)—the presumption that First Nations people were 'dying out' or 'long-gone' was active in settler discourses about Aboriginality (as made clear by Beadell's characterisation of the 'ancient,' 'absent' figure of the First Nations subject). In the appropriation of icons of Aboriginality to characterise the nuclear bomb, and particularly in the invocation of totemism, this implicit equivalence is apparent in the settler cultural imaginary: that Aboriginal Australia and settler Australia are connected—are drawn into a kin-like relationship—by a shared vulnerability to nuclear extinction. And in the process of disavowing this unacceptable equivalence in the settler imaginary, the figure of the Aboriginal person has been 'atomised' into the mushroom clouds of plutonium bombs, into antiquity, into absence, into words from which meaning has been evacuated.

The atomic totem, then, an icon of mutually assured destruction, is a response to the irreconcilable contradictions presented to settler Australia by the endurance of Aboriginal peoples in spite of the violence and illegitimacy of colonisation and settler occupation, including in its new

nuclear iteration.[6] It is not only an acknowledgement of a disavowed form of kinship—given that the atomic totem is accompanied by an as yet unrealised threat of complete annihilation, it also seems to be one of the few devices by which the settler imaginary can conceive of a shared future. The struggle to articulate a vision for the future in Australian political discourse—particularly a vision that can accommodate Indigenous and non-Indigenous Australia—has been written about in terms of the failure of national narratives to either confront or evade the nation's difficult history. Australian literary scholar Philip Mead, for instance, writes of the Australian settler colony's fixation on finding and telling national narratives in terms of a "pathology" and argues that the "suffering" evident in "these distorted and distorting public expressions is about the deep deformations of collective storytelling, a psychic economy of unspeakable histories, and the spectre of a story-less future, or chaos" (Mead 2018, 526). The chaotic, story-less future is what is captured and dealt with by the settler imaginary's fantasy of the atomic totem, which at least imagines a future equally uninhabitable for all; indeed, since it represents complete annihilation, the awful irony is that this is a symbol that is more successfully able to accommodate contradictions and neutralise distortions than the various other attempts at national symbolic unification.

In this regard, the atomic totem could be thought of as a vision, then, of a kind of morbid reconciliation. The utopian discourse of reconciliation has emerged in the politics of settler states around the world, offering a vocabulary and iconography of redress, consolidation, and transformation for settler-colonial nations grappling with violent pasts as well as with the ongoing suffering and entrenched disadvantage resulting from the dispossession of Indigenous populations (Edmonds 2016). In Australia, public discourses of 'reconciliation' between First Nations and settler Australia emerged most fully in the early 1990s when the Labor government, under prime minister Bob Hawke, promulgated a reconciliation movement in place of more substantive action towards Indigenous land rights or a treaty; while both of these courses of action were flagged in the early days of the Hawke government, they were ultimately abandoned after pressure from resources lobbyists and other interest groups (Edmonds 2016). The notion of reconciliation, then, for all of its emotional and affective power, was also an attempt to envision a future for both Indigenous and settler Australia that did not involve any great compromise for the settler nation and its economic structures (although the movement went on to mark some "significant achievements" in terms of raising broader awareness about and fostering recognition of Indigenous issues) (Edmonds 2016, 97).

6 W. E. H. Stanner was perhaps giving voice to this morbid aspect of the settler colonial imagination in 1968 when he ominously remarked: "The twentieth century and the Stone Age cannot live together" (1969, 22).

The reconciliation movement tended to be described in language that connoted healing and the spanning of rupture. Prior to Hawke's election in 1983, for example, his campaign was founded on this platform of 'national reconciliation, national recovery, and national reconstruction' articulated under the slogan 'Bringing Australia Together;' the most prominent public performances of this reconciliation movement were a series of bridge walks (Pratt 2005). However, as well as being critiqued as a performative display of nationalist fantasies of unity and a means of relieving settler feelings of shame rather than a genuinely transformative process that could bring about substantive legal change or reparations that materially benefit Aboriginal people (Edmonds 2016, 93), the movement has been critiqued for the weakness of this imagery. From the perspective of one commentator, a leader in an Aboriginal and Torres Strait Islander Christian congress, its failure was partly due to a paucity of historically specific symbolism: "I don't think we have powerful symbols that link us together in a deeply mythic way" (Rev. Grant Finlay as cited in Edmonds 2016, 102). Bizarrely, though, as this article suggests, the psychic work on developing such symbolism may in fact have begun decades earlier: the same settler longing for unanimity is apparent in prototypical form in the figure of the atomic totem, which, as a precedent to the reconciliation movement at a time of broader public silence about Indigenous issues, *figured the same desire for conciliation morbidly in terms of an imagined or potential mutual extinction*. Not fully or coherently articulated in the form of a statement, but present in a disavowed symbolic formulation which both acknowledges and denies settler Australia's affiliation with Aboriginal Australia, the reconciliation discourse appears proleptically, latent in the settler Australian imaginary's bleak resolution to the otherwise irreconcilable and shame-inducing contradictions of its violent history which it was unwilling to resolve politically; at the same time, anxieties and difficult feelings about the use of weapons of mass destruction are displaced onto Aboriginality. The morbidly sublime moment of the end of history was the arena, it seems, in which the mid-century settler imaginary could face the unattended figures of the First Peoples, and in which the nation could finally be 'brought together;' meanwhile, having contained these bad feelings and contradictions, the work of nuclear imperialism could continue and the reality of the endurance of Aboriginal people could remain unacknowledged, obscured by silence.

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Roxanne Panchasi

"You don't screw with the Sahara"[1]: Radioactive Dust and the Return of the French Imperial Repressed

Abstract: In 2021 and 2022, traces of the series of nuclear bombs France detonated in Algeria during the 1960s seemed to 'come home' in the form of tons of 'lightly radioactive' Saharan sand that filled the atmosphere above and rained down onto surfaces throughout France. Multiple commentators characterized this 'African dust' as a postcolonial 'boomerang,' the return of a repressed past, a haunting, and a kind of revenge. This article considers closely the range of representations of this Saharan sand in France as material and metaphoric deposits on the contemporary landscape. Pursuing the coincidence of these recent episodes of a recurrent phenomenon with the crisis of the COVID-19 pandemic and a particular moment of reckoning in the history and legacies of French nuclear imperialism in North Africa and the Pacific, the article examines radioactive dust as memorial evidence, toxic residue, and imperial remains.

Keywords: Algeria, France, Sahara, Dust, Nuclear Weapons

1 My title is borrowed from a *Copenhagen Post* headline from March 1, 2021: "You don't screw with the Sahara: How Denmark has been caught in the crossfire of a six-decade grudge" (Hamilton 2021).

> Dust is the opposite thing to Waste, or at least, the opposite principle to Waste. It is about circularity, the impossibility of things disappearing, or going away, or being gone. Nothing can be destroyed [...] Nothing goes away
> (Steedman 2002, 88).

> Dust clouds are dispersed, atmospheric events. One could say: diasporic. A spreading, creeping saturation
> (Marder 2016, 65).

February 1960: Reggane and Paris

On February 13, 1960, television journalist Michel Péricard went out into the streets of Paris, microphone in hand, to interview passersby about a historic event that had taken place early that morning in the Sahara Desert: the detonation of the first French atomic bomb at a firing range near the village of Reggane, close to 1200 kilometres from Algiers and 2500 kilometres from the French capital (INA Officiel 2020). Codenamed *Gerboise bleue*, France's inaugural atmospheric nuclear explosion had a blast yield of 70 kilotons, more than four times the size of the 'Little Boy' bomb the U.S. had dropped on the Japanese city of Hiroshima in 1945. With this operation, the nation entered the *club atomique* [atomic club] of the world's nuclear-weapon states, extending the 'radiance' of its civilian nuclear research and applications since the Second World War to the military field (Hecht 1998; Mongin 2011). "Hurray for France!" President Charles de Gaulle declared in response. "As of this morning, she is stronger and prouder" (Vichney 1960).

Recording for a segment that aired that evening on *Radiodiffusion-télévision française*'s *Journal télévisé du 20H* [8 o'clock evening news], Péricard invited everyday Parisians to share their thoughts *Pour ou contre la bombe atomique*? [For or against the atomic bomb?]. Asked if she knew where the nation's first bomb had exploded, one cheerful woman replied: "In the Sahara!" "Where in the Sahara?" Péricard asked. She laughed, unable to say. "You don't know where Reggane is?" Péricard continued. "No, I've never been," the woman joked. She was certain about one thing, however: "It's very good [...] we're doing what the others are doing!"

After speaking with a few more people who expressed either their approval or concern regarding the costs and dangers of nuclear weapons, Péricard approached one last interlocutor. Other pedestrians, some with umbrellas, went about their business in the background on this cold, wet February day. The man Péricard had stopped affirmed this French bomb

detonation as "a technical and scientific achievement of the first order." Asked to identify the other states in possession of nuclear weapons, he listed the *club atomique*'s three pre-existing members: "the Americans, the Russians, and the English." "And you don't think this could have disastrous consequences for us?" Péricard queried. "Absolutely not," the man responded. "You don't think this rain that's falling is directly related to the bomb?" Péricard pressed. "No, no," insisted the man. "In my opinion, meteorological conditions and the atomic bomb have absolutely nothing to do with one another." The two chuckled, bringing the feature to a lighthearted close (INA Officiel 2020).

For these men chatting on a damp Parisian street in 1960, the idea that the weather in France might be affected by the detonation of a nuclear bomb hours earlier in the Sahara seemed comical, even absurd. But while the rain in the French capital that day may not have been caused by the explosion near Reggane, nuclear weapons and climatic conditions were not then, and have never been, mutually exclusive concerns.[2] As anthropologist Joseph Masco has pointed out, the historical "linkage between the atomic bomb and the weather" stretches back to the earliest days of weapons experimentation in the United States (Masco 2014, 80). Temperature, winds, humidity, and precipitation are all factors that can influence the outcomes of a given bomb explosion, particularly those conducted atmospherically.[3] A nuclear bomb, in turn, produces a powerful blast or shock wave, and releases a tremendous amount of thermal energy and radiation. High-velocity winds, extreme pressure in the surrounding air and atmosphere, small earthquakes, and large oceanic waves are some of the ways such explosions can alter weather patterns in the short term (Atomic Archive 1998).

In the days, weeks, and months following a detonation, the spread of fallout and radiation is shaped by changing weather conditions. Clear skies (or not) can cause clouds of radioactive dust in a desert setting to move into and through the atmosphere more (or less) quickly. Rain can precipitate fission products and other radioactive particles (including sand) downwards, contaminating soil, water, and food supplies. Over the longer term, weather variables influence the size of the geographic area affected by a given nuclear explosion and how its residual human and environmental impact shifts over time (Philippe, Schoenberger, and Ahmed 2022).

After *Gerboise bleue*, France's first atomic bomb detonation in the Sahara, came *Gerboise blanche* in April 1960, *Gerboise rouge* in December, and *Gerboise verte* in April 1961. Following these four initial aerial blasts, France exploded 13 more bombs underground, further south at In Ekker in the Hoggar Mountains. The series of 17 so-called 'tests' began during

2 A recent study by scientists at the University of Reading suggests that precipitation levels far from nuclear weapons sites may have indeed been affected by the atmospheric bomb detonations of the 1950s and 1960s (Harrison et al. 2020).

3 Reports of *Gerboise bleue* note that weather conditions, unfavourable before the operation, cleared up by the morning of February 13, 1960. In April 1961, French military and scientific officials attributed the underwhelming results of the *Gerboise verte* detonation to poor weather conditions in part (Revol and Bataille 2002; Tertrais 2013).

the Algerian War and continued—on the other side of Algeria’s independence in 1962—until 1966, when France relocated its nuclear weapons experimentation program to the Pacific.[4] The French finally evacuated the nuclear sites at Reggane and In Ekker in 1967, but the Sahara detonations’ health, environmental, and psychological effects have radiated, quite literally in some ways, for decades since.

In 2021 and 2022, traces of these bomb explosions in Algeria seemed to ‘come home’ to France in the form of tons of Saharan sand that filled the atmosphere above and rained down onto surfaces throughout the country. While these dust incursions were neither the first nor the largest experienced in France, they became the object of an extraordinary fascination inflected with contemporary anxieties about climate change and catastrophe. Darkening skies, carpeting landscapes, and diminishing air quality significantly, these dramatic weather events suggested a looming apocalypse at the height of a global pandemic during which millions of people around the world were suffering and dying from respiratory illness and failure. The sand that had made its way from North Africa to France was also radioactive. And while this feature of migrating Saharan dust was already familiar to scientific researchers well before these episodes, its more public revelation as ‘news’ in France came at a particular moment of crisis and reckoning with the history and legacies of empire, including the human and environmental costs of the nation’s nuclear weapons experimentation in Algeria. As this essay shows, it was the convergence of these factors that made it possible for multiple French and international commentators to frame Saharan dust as a postcolonial reminder, a return of the repressed, and even a form of revenge. In a French political and cultural context haunted by the past and present of the bomb in/and empire, the radioactive dust of 2021 and 2022 held material and moral significance as memorial evidence, toxic residue, and imperial remains.

February 2021: The Jura Mountains

Early in the morning of February 6, 2021, Pierre Barbey, a radiation protection specialist from Normandy, strapped on a pair of snowshoes and headed out for a hike in the Jura Mountains. As he recalled later, “the snow was white, [but] during the walk everything changed, and it lasted the whole day.” While his companions “were worried by the sight of this ochre sand that covered the ground,” Barbey, a biochemist at the Université de Caen and Vice-President of the French *Association qui contrôle la radioactivité dans l’Ouest* (*ACRO*), had experienced a similar occurrence

4 A series of plutonium experiments (codenamed *Pollen*) intended to simulate accidents rather than bomb detonations were also conducted during this period. While historical and contemporary sources regularly use the word “test” to distinguish between nuclear weapons or devices detonated for experimental purposes rather than as acts of war *per se*, there is a politics of diminishment to this usage. This is especially true when it comes to the historical dissociation between France’s atmospheric detonations in the Sahara and the Algerian War of Independence during which those detonations took place. See Panchasi, 2019.

many years before (Courageot 2021). Recognizing the substance as sand from the Sahara Desert, he collected a sample from residue that had accumulated on a car and took it back with him to *ACRO*'s lab in Hérouville-Saint-Clair, near Caen, for closer examination.

Barbey and his friends were not the only ones to notice the strange phenomenon. In many parts of France, skies had turned "an unusual color, a little orange, a little yellow, a little metallic" (Fraisse 2021). Throughout the day, national and international weather services reported and attempted to explain the "golden dust" that had fallen to the ground and onto thousands of car windshields across the country (including Burgundy, Franche-Comté, Alsace, the Vosges, the Alps, and the Lyon area), and into Switzerland, Belgium, and other neighboring states (Agence France Presse 2021; Associated Press/AP 2021; Coutures 2021; euronews (en français) 2021; Goudaillier 2021; Morin and Givord 2021; Munier 2021; Shepherd 2021; L'Union 2021). Images of the sand proliferated on social media platforms like Twitter, TikTok, Instagram, and Facebook (Beauchemin 2021; Yahoo News! 2021).[5] In snow-covered regions, the effect was particularly striking (Jenni 2021; Webber 2021). Shona Tate of the British Alpine Ski School in Chamonix described the scene: "A bit like doomsday here today […] it's raining Sahara sand" (PlanetSKI 2021). "Don't eat the orange snow!" warned the UK's *Daily Mail*, describing the "freak weather incident" that had "turn[ed] the Alps ski resorts deep apricot after being blown thousands of miles from Africa," by "strong winds" known as sirocco. The publication's website linked to tweets featuring images of "the sky, the snow, looking like a Martian landscape" (Webber 2021). Comparisons to the red planet, where sandstorms are a regular occurrence, abounded in reactions from different quarters (RT International 2021; Thomas 2021).

Ominous and unprecedented for some, these scenes were more familiar to people like Fanta Diarra, President of *L'Association des étudiants maliens de Lyon*. "Many of us said, 'It's so beautiful.' It was a bit like we were back home" (Morin and Givord 2021). Abdallah Ag Ikasstan, a 33-year-old Nigerien delivery person who was born in the Sahara but lives in Lyon, immediately recognized desert sand as the cause of the heavy colourful skies over the city. "At home in Niger," he explained, "it's a banal thing, a bit like snow or hail during certain seasons in Europe. We experience this phenomenon during the rainy season from June to August. Sometimes we have violent sandstorms." These sorts of occurrences did not make him particularly uneasy. "I found it funny because it's unusual here," he explained. "And I liked it because it reminded me of the country I left four years ago. A little piece of Niger came to join me in France" (Morin and Givord 2021).

5 An advanced search on Twitter for "*sable Sahara*" results in over 80 tweets from February 6, 2023 alone. These include posts from weather outlets and individuals throughout France, along with numerous photographs of tinted skies, snow, and cars covered with sand.

Moving "between anxiety and wonder," witnesses throughout France described the phenomenon as both "eerie" and "magical," capturing what they saw in countless photographs and videos posted online (Beauchemin 2021; Le Dauphiné Libéré 2021; Yahoo News! 2021). Some appreciated the picturesque effect; the way the sand's orange/reddish tint recalled the "sepia" tones of a vintage photograph or postcard (Humbrecht et al. 2021). Others got an "end of the world" or "apocalyptic" feeling that brought to mind futuristic films like Denis Villeneuve's 2017 *Blade Runner 2049* (Beauchemin 2021; Le Dauphine Libéré 2021; Jenni 2021; Pauget 2021). The national news outlet *BFM TV*, among others, broadcast scenes of this "science fiction landscape," noting the spectrum of deep oranges, pinks, and greys in the sky over different French cities. In a segment entitled "*Le sable du Sahara s'invite en France*" [Sand from the Sahara invites itself into France], Stéphane, an amateur photographer, shared his images of Lyon and its landmarks bathed in the unusual light. "I've never seen anything like it [...] this yellow in the sky. [...] It makes one think of a post-apocalyptic world" (BFMTV 2021; Gomez 2021).

Photograph of the rue Gustave Nadau in Lyon by John-Grégoire, February 6, 2021. Creative Commons Attribution-Share Alike 4.0 International Licence.
https://commons.wikimedia.org/wiki/File:Une_rue_de_Lyon_(France)_sous_une_couche_d%27air_saharien.jpg.

The references to the end of the world in these reactions to Saharan dust traded implicitly on widespread concern about climate change that some other observers addressed head on. Meteorologists in France such as Paul Marquis believed that "the sirocco's arrival in early February [2021]

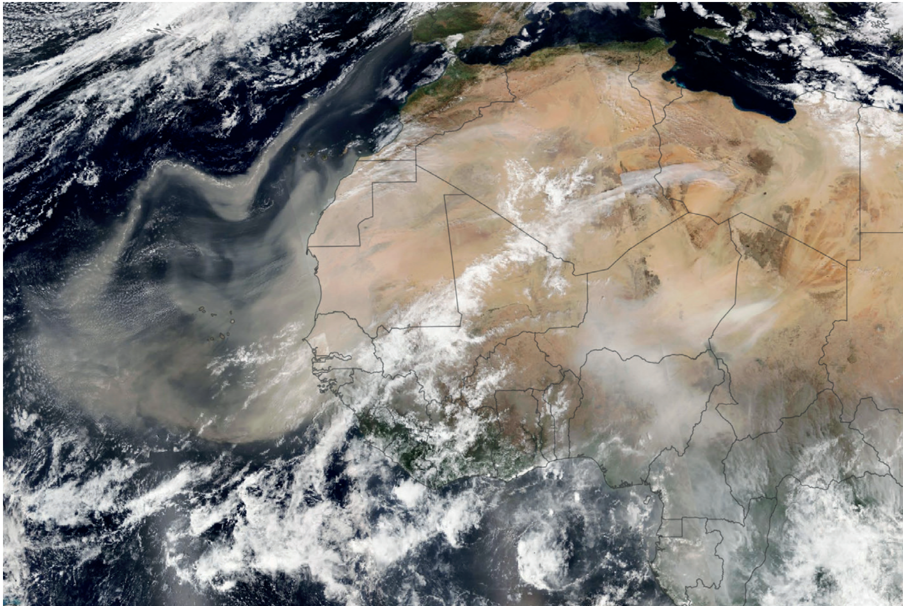
instead of April" was evidence of global warming (RT International 2021). A journalist's 2022 description of a subsequent dust occurrence characterized the "amber gloom" caused by Saharan sand as "evocative of forest fires" (Cappucci 2022). Reaching over and again for the imagined catastrophes of science fiction, multiple onlookers also expressed anxiety about the present and possible future environmental and other distresses this strange weather appeared to manifest and foretell. At the same time, these accounts also seemed to derive a certain pleasure from an aesthetics of apocalypse as dramatic spectacle, a set of special effects, like social media filters, and a vibe.

A Long History of 'African Dust'

While reactions to the phenomenon in early February 2021 were particularly intense, this was not the first time that sand from the Sahara had blown into France, nor would it be the last. Indeed, two more episodes followed during that month alone, on the 21st and the 28th. Less impressive waves hit France later in the year with another significant episode occurring in the spring of 2022 (Cappucci 2022; Matricon 2021; Le Parisien via Dailymotion 2022). On each of these occasions, witnesses came back to the same tropes: the "strange and distressing" yellows and oranges of darkened skies "as during a solar eclipse" or the "end of the world" (Corre 2022); scenes that felt "spooky," "apocalyptic," and "Martian" (Cappucci 2022; In the Vendée 2022; Phillips 2022). And during each instance, images of the curiosity flooded online (Merlier 2022). One Alsatian daily commented with relief: "The apocalypse? Thankfully not!" This weather anomaly was apparently not that uncommon and "more or less spectacular depending on the year" (Dernières nouvelles d'Alsace 2021).

As news outlets explained repeatedly, these events were "surprising, but not really rare in France" (Gindre 2022). Every year, powerful winds lift up millions of tons of Saharan sand into the atmosphere that then travel around the globe. This massive dust migration affects the Earth's climate and biological systems, degrading air quality and speeding up the melting of snow in colder regions by absorbing more of the sun's light and heat. The dust also fertilizes the ecosystems through which it travels, including major sites such as the Atlantic Ocean and Amazon rainforest, nourishing plant life with calcium and other minerals and nutrients (Agostini 2019; Calatayud 2021; Lequy et al. 2018; meteo-paris.com 2022). As one 2021 report pointed out, the phenomenon "isn't all bad," and could be "good news" for gardeners (RT International 2021). The sirocco that blows south

to north also carries enormous amounts of this Saharan sand into Europe each year, though typically in smaller quantities spread out over longer periods of time. The effects are not usually as pronounced as they were in 2021 when high concentrations of Saharan dust moved into France during a brief period (World Meteorological Association 2021).



NASA Earth Observatory image of Saharan dust by Lauren Dauphin, February 18, 2021. Public domain. https://earthobservatory.nasa.gov/images/147952/saharan-dust-heading-for-europe.

The scientific and wider public interest in these recent episodes was embedded within a longer history of studies of large-scale dust migrations and their impact around the globe. As early as the 1830s, Charles Darwin had taken an interest in patterns of dust moving from the African continent across the Atlantic (Prospero et al. 2021, 1240). Into the twentieth century, scholars continued to study the phenomenon, noticing that certain decades were marked by "increased dustiness" (Evan et al. 2016, 494). Given that North Africa is "the largest and most persistently-active" point of origin for the phenomenon, the Sahara has been a continual focus of this work (Prospero et al. 2021, 1240). In the French context, a "spectacular dust event" in 2004 brought an influx of "huge quantities" of sand particles from the Sahara (Menut, Masson, and Bessagnet 2009). That year, deposits of approximately 500,000 tons blew into Corsica alone. An estimated 2 million tons came through the parts of France south of "a line

from Nantes to Besançon" (Gouthière 2022; Masson et al. 2004, 4). More significant in various ways, this "historic sirocco" became a reference point in discussions of the 2021 and 2022 episodes (Agostini 2019; Chaulet 2021; Roussel 2022; Rozières 2021).

Given that the phenomenon itself was not unusual, and that a much more impressive wave of sand had hit France less than two decades earlier, what accounted for the flurry of scientific, media, and public attention to these more recent instances? Their striking visual effects? Their repeated occurrence during a brief timeframe? The possibilities of widespread dissemination of images via social media platforms, most of which did not yet exist in 2004?[6] These things certainly go part of the way towards explaining the fascination with these fresh bouts of vivid skies, sandy rain, and residue. But the timing of all this mattered deeply for other reasons as well. Polluting the air, the Saharan dust that swept through France in 2021 posed an additional public health problem during a moment of unprecedented crisis. Scientific and medical researchers had been studying the negative effects of Saharan dust migrations for years, linking them to a range of potential health consequences, including the triggering and aggravation of mild to severe respiratory illnesses in adults and children (Gyan et al. 2005; Karanasiou et al. 2012; Masson et al. 2010; Menut, Masson, and Bessagnet 2009; Organisation météorologique mondiale 2017; Perez et al. 2008). But the COVID-19 pandemic completely transformed the landscape of concern and fear regarding the dangers of poor air quality and the airborne spread of disease.

In the coverage following the February 6, 2021 episode, questions arose about the health impact of Saharan dust, particularly with respect to COVID-19 transmission (Calatayud 2021; García-Pando, Perez, and Basart 2021; Hetsch 2021; Pauget 2021; Sprautz and Brault 2022). In addition to respiratory irritation or illness that might be caused by the inhalation of the dust's fine particulate matter (PM), it was possible that this form of air pollution might exacerbate the spread of the virus, its range of symptoms, and ultimate consequences, including death, for those who become ill. Early on in the pandemic, scientists working in different parts of the world had begun to pose questions about possible Saharan dust-COVID connections. One team of researchers had concluded that "high PM 2.5 concentrations—favored by air temperature inversions or Saharan dust intrusions" were particularly dangerous in the context of the pandemic. According to these experts, "desert dust events […] can [also] be a vector for fungal diseases, thereby exacerbating COVID-19 morbidity and mortality." Such studies stressed the importance of "monitor[ing] not only the prevalence of the virus, but also […] the occurrence of weather situations

6 Facebook launched in February 2004, Twitter in 2006, Instagram in 2010, and TikTok in 2016.

that can lead to sudden, very explosive COVID-19 outbreaks" (Rohrer, Flauhaut, and Stoffel 2020, 789). Furthermore, health recommendations during Saharan dust episodes were the same as those for the prevention of the pandemic's spread: avoiding exposure by remaining indoors and wearing a well-fitted N95 mask (Manceau 2022). Indeed, several news stories in 2021 and 2022 made connections between the two, advising people to take similar measures to fight the twin threats posed by COVID and Saharan dust (Gustave 2022; Septier 2021; Sprautz and Brault 2022).[7]

By 2021, people in France, as elsewhere, were poised to receive and respond to the presence of Saharan dust in the skies above their heads, or on their car windshields, in ways they never had been before. COVID-19 intensified to an unprecedented degree what critic Jean-Thomas Tremblay has referred to as "the respiratory enmeshment of vitality and morbidity" and the material and metaphoric associations between breath and death had become an obsessive preoccupation of the moment (Tremblay 2022, 2). As one writer in *Forbes* commented in 2022, "In an era of COVID-19 virus, dust transport of bacteria and microorganisms certainly takes on new meaning for even the casual observer" (Shepherd 2022). While Saharan dust was not a totally unfamiliar phenomenon, the pandemic had imbued its particles with a whole new menacing physical and psychological significance. Already visually and aesthetically 'apocalyptic,' it threatened to take people's breath away in a truly horrifying sense.

Return to Sender

A few days before France's third major Saharan dust episode in February 2021, *ACRO*—the regional radiation monitoring organisation Pierre Barbey works with—released a communiqué regarding the Saharan dust sample the biochemist had collected earlier that month. Reproducing photographs that Barbey had taken of the tinted snowy Jura landscape and a vehicle covered with fine deposits, the *ACRO* statement confirmed that the dust "contain[ed] traces of radioactive pollution dating from the atomic bomb tests conducted by France in the 1960s" (ACRO 2021). Having subjected the sample to gamma spectrometry analysis, *ACRO*'s lab had found traces of cesium-137, a radioactive isotope that does not exist in nature, but is a fission product of nuclear bomb detonations, as well as disasters such as those at Chernobyl in 1986 and the Fukushima Daiichi Nuclear Power Plant in 2011.[8]

Acknowledging the "520 atmospheric nuclear tests" conducted by "the United States, the Soviet Union, the United Kingdom, France, and China" in

7 This has also been the case in places where smoke from seasonal forest fires has combined with and contributed to extreme summer heat aggravated by climate change (particularly up and down the West Coast of North America), leading to extremely poor air quality. See, for example, the U.S. Centers for Disease Control and Prevention's advisory regarding fires and COVID-19 (CDC 2022).

8 At the time of *ACRO*'s founding in the wake of the Chernobyl nuclear plant disaster of 1986, Barbey had participated in the analysis of samples of another Saharan dust episode that bore traces of radioactivity.

the decades after the Second World War, *ACRO*'s statement emphasized France's contribution to a global nuclear contamination during this era, the lingering traces of which can be found in bodies and environments all over the planet. This 'new' radiation detected in France was therefore an addition to existing levels of contamination from previous Saharan dust episodes *and* the cumulative effects of the atmospheric nuclear detonations conducted by *all* of the nuclear-weapons powers since 1945 (Higuchi 2020, xi).[9] Chernobyl, Fukushima, and a range of much smaller emissions from civilian nuclear power sites were more and less significant contributors to this base layer of radioactivity that can be found in soil and other samples across the globe. According to one report in 2022, the *Institut de radioprotection et de sûreté nucléaire* (IRSN) has been tracking this generalized radiation in France since at least 2000 (Puaud 2022).

Following *ACRO*'s revelation on February 24, 2021, the radioactivity of Saharan dust became the focus of several reports and provocative headlines 'breaking' the story. French and international news outlets jumped on the quirky tale of Barbey's discovery while snowshoeing and quotes from the biochemist appeared in several articles focused on the radioactivity of his samples (Chaulet 2021; Courageot 2022; France Info 2021; Jenni 2021; Le Parisien 2021). From late February onward, coverage of the dust episodes almost never failed to note the traces of cesium-137 they contained. Journalists also shared repeatedly the conclusions of medical and scientific experts who insisted that the radioactivity of Saharan dust did not pose a health risk for people in France, its levels falling well below doses considered dangerous for the general population. The contamination of these fine particles was "[n]othing serious" and even "tiny;" little more than "a historical vestige" (Jenni 2021). In the end, the dust particles were only "lightly radioactive" (Julien 2022; Métro Belgique 2022; SudOuest 2022) and "completely inoffensive as opposed to the air pollution they engender" (Sprautz and Brault 2022).

What made *ACRO*'s 2021 statement and the ensuing public interest remarkable was the fact that the presence of traces of cesium-137 in Saharan sand was something that was already well known to scientists in France, as elsewhere. When the *IRSN* published its report on the dust events of February 2021 in early March of that year, the organisation was careful to note that, while there had been an increase in levels of radioactivity in the air picked up by its OPERA detection network during these episodes, "they [were] nonetheless lower than those of a similar episode in February 2004" (IRSN 2021). Apparently, during that episode (discussed above), the "values were so high that instruments became unusable" (Menut, Masson, and Bessagnet 2009, 2). Even then, however, experts had determined that

9 For more on the notion of a 'global hibakusha,' see "The Human Cost of Nuclear Testing" (ICAN 2022).

poor air quality, rather than radiation exposure per se, was the more significant health risk posed by these events (Manceau 2022; Rozières 2021).

Barbey himself had acknowledged that the radioactivity detected in his recent sample was "weak," insisting, "the point is not to say that the [French] population is in any danger." In France this pollution was a "passing" and relatively benign phenomenon (Puaud 2022). From the perspective of organizations like *ACRO*, however, it was the potential memorial function of Saharan sand, rather than its radioactive toxicity *per se*, that gave it historical and political significance decades later. While the exposure to radiation from Saharan sand might be minimal for those in contemporary France who were "very far away" from the source, "this is not at all the case for those nearby populations […] who live in those regions that, 60 years ago, sustained extremely significant exposures" (Gouthière 2022; see also Baha eddine 2021 and France Info 2021). As Barbey explained to one interviewer, "the […] people of that region of the Sahara live in this environment that has been polluted for a long time." It was therefore important to "remember what the origins [of these traces] are and the responsibility of France in these nuclear tests" (France Info 2021).

The Saharan dust that had been photographed all over the nation made apparent what Gabriele Schwab calls "the invisible danger" of radiation (Schwab 2020, 163). As scholars like Akira Mizuta Lippit, Joseph Masco, Peter van Wyck, and Kate Brown have shown, the 'not seeing' in the long history of nuclear harm and catastrophe poses a recurrent obstacle to the individual and collective understanding of threat and risk, as well as the possibility of appropriate acknowledgment or anything like justice for the multiple global victims of nuclear bombs and accidents (Brown 2017; Lippit 2005; Masco 2013; van Wyck 2013). Bearing detectable traces that could be linked to France's nuclear detonations in Algeria, Saharan dust did something rare indeed: it gave that radioactivity visual form, texture, and vibrant colour.

For radiation scientists, however, the question of origins has "constitute[d] an always open discussion" (Menut, Masson, and Bessagnet 2009, 9). Studies of the cesium-137 found in the dust that blew into France in 2004 were able to draw conclusions about the timing of original contamination, but experts were unable to determine the degree to which France's *Gerboise* atmospheric detonations of 1960–61 are responsible for the radioactivity in question. Apart from the fact that the sand cannot all be traced back to the areas of the Sahara where France detonated its bombs in the 1960s, France was also not the *only* power to contribute to global nuclear contamination during that period. While the French state is certainly responsible for its nuclear weapons activity in Algeria, Saharan

sand (and its migrating dust) was, like surfaces and bodies around the world, contaminated by the radiation released from bombs detonated atmospherically by multiple states after 1945. That same desert sand has also been exposed to other forms of radiation, including emissions in the wake of major disasters like Chernobyl and Fukushima (Masson et al. 2004; Menut, Masson, and Bessagnet 2009; Masson et al. 2010).

Well aware of these complexities, and careful to reassure the public about low exposure levels and insignificant health consequences, *ACRO*’s 2021 statement nevertheless referred to Saharan dust as a ‘boomerang’ returning to France. Inspired by the organization’s provocative heading, *Nuage de sable du Sahara: une pollution radioactive qui nous revient comme un boomerang* [Cloud of Sand from the Sahara: radioactive pollution that returns like a boomerang], the French and international media ran with the image. The *effet boomerang* [boomerang effect] appeared again and again in stories about this revelation that did not, strictly speaking, contain any new information about the dust’s radioactivity (Chaulet 2021; Courageot 2021; Earth Chronicles Life 2021; Papadopoulos 2021). The figure of a boomerang then seemed to clear a path for a proliferation of metaphors of homecoming and haunting. Saharan dust episodes were a “return to sender” of the nuclear contamination of Algeria in countless ways: “like a rubber band in the face,” or an “invoice” presented to a “taxpayer” (Julien 2022). Several authors in France and internationally highlighted the dust events as “ironic” (Cereceda 2021; Hamilton 2022; Puaud 2022), reflecting on how “atomic bomb testing and colonial history ha[d] come back to haunt France in the form of a radioactive Saharan dust cloud” (Hale 2021). “Prodigal fallout returns,” remarked futurism.com’s Dan Robitzski in March 2021, reflecting on this “poignant reminder of the long lasting impact that nuclear fallout can have on an area” (Robitzski 2021). “C’est l’arroseur arrosé,” suggested Sébastien Julien of *L’Express* during the March 2022 episode, referring to a Lumière Brothers’ 1895 short film in which a boy plays a trick on a gardener who then gets doused with his own hose. The English expression that best captures the sentiment: “The joke’s on you/them/us” (Julien 2022).

Vent de sable

As physicist and theorist Karen Barad has pointed out, the nuclear “event” is one that “refuses to end, that decays with time but will forever continue to happen” (Barad 2017, 69). Decreasing by 50 % every 30 years, traces of an element like cesium-137 exist within the “long temporalities” of “the

nuclear" (Puaud 2022). This half-life is what allows scientists to date radiation levels, linking their remainders to different historical moments, in this case, the atmospheric tests of the 1960s. In this frame, Saharan dust in France was an apparition, a ghost of past and present, and an embodiment of the "nuclear uncanny" (Masco 2013, 30–31; Schwab 2020, 163). Sand bearing the radioactive markers of that era had arrived in France as a memory returns to consciousness, bringing "messages" from a nuclear-imperial space and time that could not and had not been forgotten in Algeria, and should not be forgotten in France (Louni 2021). It was a "scathing reminder of history" (Rioux and Yahiaoui 2021) with legacies that acted like "a slow poison," (Puaud 2022).

In the coverage of the 2021 and 2022 episodes, Saharan dust became forensic evidence, a souvenir, and a form of karma and/or revenge. Playing on the associations between sand, erosion, time, residue, and harm, different commentators mobilized representations that sedimented easily (Acharya 2021; Courageot 2021; Métro Belgique 2022). In these imaginative tellings, the Sahara was saturated with human attributes, affect, and motivations. "[N]ot content with just modifying the colour of the sky," the desert had a memory, a will, and a range of emotions including anger and desire (Courrier International 2021). Referring to the 'vengeance' of the Sahara, and of Algeria, journalists in France and elsewhere framed these episodes as a kind of postcolonial retaliation (CAREP 2022; Des Groux 2021; Papadopoulos 2021). Just as France had once laid claim to Algeria, Algeria was now laying claim to France. "You don't screw with the Sahara," joked one writer, casting Denmark as an innocent bystander "caught in the crossfire" of "an old score" between Algeria and France (Hamilton 2022).

Already troubled by the question of France's sole vs. shared responsibility for the dust's radioactive traces, the narrative of a wronged Algeria seeking payback caught on despite the fact that France was not the only country to experience these dust episodes. The skies, snowy landscapes, and car windshields of Spain, Belgium, Switzerland, and even Denmark had also been affected. But just as the media coverage zoomed in on radioactivity, so too did it emphasize France, rather than Europe more broadly, as the dust's principal destination and target. The point of origin for Saharan dust also became more specific as the story developed. Before the release of *ACRO*'s February 2021 statement, explanations of the phenomenon had referred to a low-pressure system "off the coast of Morocco" (Agence France Presse 2021; euronews (en français) 2021; S. A. 2021). It was *ACRO*'s 'boomerang' that sealed the deal on a confrontation between two nations, France and Algeria, still haunted in the present by a violent and complicated past.

Figured as a return of the repressed, the dust episodes that hit France in 2021 and 2022 became re-enactments of the original, traumatic *vents de sable* created by French bombs in Algeria where 'sandstorm' is one of the ways local inhabitants describe the detonations that continue to affect their lives to this day (Larbi Benchiha 2008). "[T]heir apocalypse there was one of flames," wrote Alexis Jenni in *La Croix*. "A half century afterwards," the journalist went on, "we are reaping the ashes that have not altogether cooled" (Jenni 2021). Voices like Barbey's and Jenni's pointed to the constellation of ongoing health and environmental harms resulting from France's nuclear experiments in the desert. While the history of the nation's nuclear imperialism in the Sahara had been "silenced for several decades" at home, French veterans and Algerians exposed to radiation have been living with this past for more than a generation (Gomez 2021).

Still struggling into the 2020s to have their demands for recognition and compensation addressed sufficiently, Algerian victims in particular have not benefited from the 2010 *Loi Morin* intended to acknowledge and compensate victims in both the Sahara and the Pacific (Collin and Bouveret 2020; ICAN France 2022; Journal de Dimanche 2022). Of the 1747 applications for compensation filed between 2010 and 2020, only 53 were from Algerians. The 584 dossiers from that period that resulted in some form of restitution for victims includes only one Algerian, a man who served in the French military (Gomez 2021). The requirement that petitioners document their presence at/near Reggane or In Ekker, along with the fact that French was, for 13 years, the sole language of the bureaucracy of recognition and restitution, has made the process more challenging for many victims (RFI 2022). It is therefore not surprising that to date none of the victims from the areas in the Sahara where France actually conducted its bomb experiments have been compensated (CIVEN 2022).

In addition to victims' exposure to radiation from the French bombs detonated between 1960 and 1966, the Sahara itself was and remains scarred and haunted by those detonations, its sand polluted and vitrified in places by the extreme heat of atmospheric explosions, its mountains contaminated by underground blasts that were not always contained successfully by the galleries intended to hold them (Barrillot 2003).[10] France's nuclear impact in the region also endures in the form of radioactive waste the former colonial power left behind in 1967 after shifting its nuclear weapons program to the Pacific. Following terms negotiated with the incoming government of what became an independent Algeria in 1962, the French departed without committing to the thorough dismantling of sites, environmental cleanup, or ongoing health monitoring of the local population. Instead, the desert became a burial site for remnants of the

10 Recently, the architectural historian Samia Henni has suggested naming the "anthropogenic radioactive geology" of Saharan vitrified sand and nuclear debris "Jerboasite" (Henni 2022).

massive infrastructure the French had built there, a sandy "nuclear crypt" for what is left of the physical plant, technical apparatus and tools, vehicles and materiel, some of which the military had deliberately exposed to the effects of bomb blasts.[11] These discards are what activists Jean-Marie Collin and Patrice Bouveret have called the "hidden face of the French atomic bomb" (Collin and Bouveret 2021). "The nuclear past," they insist, "must no longer stay profoundly buried in the sand" (Collin and Bouveret 2020, 9). Seeking the release of archives indicating the precise locations of this toxic matter, organizations such as the French *Observatoire des Armements* and the International Campaign to Abolish Nuclear Weapons (ICAN) have been petitioning for years for the French government and military to share what they know, to acknowledge and engage in meaningful reparations with respect to this ongoing environmental contamination.[12] This has included calls for France to 'repatriate' its discarded nuclear waste in the Sahara, a material and moral 'return' to be initiated by a 'sender' willing to assume responsibility for its crimes. Still decaying materially, radioactively, and politically, this (nuclear-) "imperial debris," is a form of what Ann Stoler terms the "ruins of empire," remains of a violent past with lasting effects into the present (Stoler 2008, 194).

Long before the Saharan dust episodes of 2021 and 2022, activists and researchers like Collin and Bouveret, and the late Bruno Barrillot, as well as groups representing the interests of victims in France and Algeria, had been working to increase public awareness of the history and legacies of the Saharan detonations, of the violent and unjust past and dangerous potential future of nuclear weapons more broadly. Based in Lyon, the *Observatoire des armements* (originally co-founded by Barrillot and Bouveret) has done remarkable work to archive and disseminate this history. *ICAN* has been instrumental in bringing to fruition the *Treaty on the Prohibition of Nuclear Weapons* adopted by the United Nations in 2017. In addition to requiring that signatories renounce the development and possession of nuclear weapons, that treaty insists on forms of restitution for victims and outlines responsibilities with respect to the environmental management of nuclear waste (UNODA 2017). Algeria has signed, but not yet ratified, the treaty. France, like the rest of the world's nuclear-weapon states, has not signed.

The *Treaty on the Prohibition of Nuclear Weapons* went into force on January 22, 2021, two days after renowned historian of Algeria Benjamin Stora submitted a report French President Emmanuel Macron had commissioned him to write. Entitled *Questions mémorielles portant sur la colonisation et la Guerre d'Algérie*, the 'Stora Report' revisited the history of French colonialism in Algeria, and especially the events and legacies

11 The term is one that Schwab elaborates on in *Radioactive Ghosts* (2020, 230–235).

12 Additional pressure has come from the release of *Toxique*, a powerful study of the impact of France detonations in Tahiti Nui ('French Polynesia') published in 2021 by Sébastien Philippe and Tomas Statius. Showing fundamental flaws in military and state conclusions about the impact of detonations on local populations and the environment, the work has led a broader reckoning regarding nuclear programs in the Pacific, including the release of archives.

of the Algerian War of Independence. Addressing a number of concerns, including the question of archives, Stora mapped out a set of recommendations for a program of acknowledgment and commemoration between France and Algeria, including a coming to terms with France's nuclear 'tests' in the Sahara. Arguing for the "work of memory, truth, and reconciliation," Stora drew attention to "traces, remnants, and memories" of colonisation and the Algerian War (Stora 2021, 2). According to Stora, the present in which France and Algeria remain tied to one another is one in which the past never "ceases to return" (5). And in this mix of complex experiences and unresolved emotions, there is sometimes "a desire for vengeance" that continues to pull France and Algeria apart as it also binds them together (12).

If the metaphorics of return and revenge could be used so readily to narrate episodes of radioactive dust in 2021 and 2022 (the 60th anniversary year of Algeria's independence), it was because these figurations were already part of the language of a difficult history between two nations that have grappled with their 'postcolonial' relationship to one another for decades. Meaningful beyond the realm of radioactive particles and effects, a vocabulary of toxicity has played an important role in discussions of the political legacies of empire in both France and Algeria, performing a double duty when it comes to the issue of France's nuclear imperialism in the Sahara (Hamdi 2022). The nuclear and broader colonial past left a "bitter fallout" (Deutsche Welle 2020) that continues to "poison ties" (France 24 2021) and "pollute relations" (Mezahi 2021) between the two countries more than 60 years later.

Algerian observers who followed the Saharan dust events of 2021 and 2022 also made connections between radioactive traces and a broader history of colonial violence and injustice that continues to resonate on both sides of the Mediterranean (Bouzeghrane 2021; L'Expression 2021; Louni 2021; Mohamed K. 2021). Considering the "messages" embedded in the desert sand, journalist Arezki Louni noted the timing of the episode in relationship to ongoing struggles between Algeria and France, particularly when it comes to the nuclear past. "At the moment when the memory file between Algiers and Paris is on the table," Louni wrote, "the old colonial power is haunted by its crimes." According to Louni, the "arrival in France of a cloud of sand from the Sahara, bearing radioactive particles" had "relaunched the debate over the effects of French nuclear weapons tests in Algeria from 1960 to 1966" (Louni 2021). Falling at an important juncture in the negotiation of the nuclear and broader political and cultural past, present, and future, the Saharan dust episodes of 2021 and 2022 made a powerful and particular kind of sense at a moment of critical reckoning

and convergence. Writing for the Algerian daily *El Watan* on February 28, 2021, the moment of the third major Saharan dust episode in France within a month, journalist Nadia Bouzeghrane linked *ACRO*'s findings to the "Franco-Algerian reconciliation President Macron is seeking." "It's going to take actions, not statements," she insisted (Bouzeghrane 2021). Indeed, the "lightly radioactive" Saharan dust haunting France can only fulfill a meaningful memorial function if these recurrent 'apparitions' become more than a quirky set of weather events with no further consequences. When the social media posts of yellow and ochre skies have received the bulk of their likes and the lineups at local car washes have died down, when the shock of this latest 'revelation' has faded, what new forms of acknowledgement and justice can Algerian victims expect?

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Ordinary Hauntings in Irradiated Land

Abstract: Examining three art projects that rely upon the materiality of nuclear exclusion zones in Chornobyl and Fukushima, I propose a framework of haunting to understand how everyday things become saturated with the everyday lives of those who lived with them. These art pieces (Michael Marder and Anaïs Tondeur's *Chernobyl Herbarium*, Eva and Franco Mattes's *Fukushima Texture Pack*, and Ai Weiwei's *A Ray of Hope*) do not represent or document the disaster as momentary or as spectacular, but as a slow durational violence that is experienced in the daily lives of people, the land, and the material things left behind after evacuation. Rather than an aestheticisation of disaster itself or of the Zones as post-apocalyptic pastoral, these works haunt us with the ordinary affect of human habitation in what are now exclusion zones and mourn the loss of a familiar and everyday place of home.

Key Words: Hauntology; Ghosts; Affect; Art; Nuclear Exclusion Zone

Introduction

> It could be dawn.
> The light, crumpled like sheets.
> The ashtray full.
> A shadow multiplies on four walls.
> The room is empty.
> No witnesses.
> But someone was here.
> …
> Come in, look around. No one's here,
> Just the breathing air, crushed
> As though by a tank.
> A half-finished sweater remembers someone's fingers.
> A book lies open, marked by a fingernail.
> (How amazing, this silence beyond the boundary!)
> …
>
> (Zabuzhko 1996, 43).

Zabuzhko's poem, *Prypiat—Still Life* commands us, in the Ukrainian original text—"*Увійдіть!*" (Uviidit') meaning "[c]ome in!" in the imperative—to enter into the space of Prypiat (Laurila 2020, 261). Written after the disaster at the Chernobyl Nuclear Power Plant in a post-Soviet context, Zabuzhko places us inside the exclusion zone, 'beyond the boundary,' in the silent and still space of the town of Prypiat.[1] Prypiat here is framed as a still-life, or in Ukrainian a натюрморт (natiurmort) from the French term *nature morte* (literally 'dead nature') for the artistic tradition of presenting unmoving things (dead animals, cut flowers, bowls of fruit, a wine glass, or a wrinkled table cloth). The organised and posed things offer a semiotic structure to express ideas of desire, delight, sacrality with a substratum of death and decay running throughout (Martin 2021, 564). Zabuzhko's poem presents the reader with unmoving things—the half-finished sweater or the marked open book—as tactile things connected to the fingers and nails of someone, someone not here in the silence. The absence of people is traced in the symbolic language of the unmoving material the reader is commanded to look at in the breathing crushed air. Everyday things, the tactile mundane materiality of life, contain the traces of those who were there before; the reader enters the intimacy of space without witnesses to look around in the liminal space of a possible dawn.

1 N.B. except when referencing specific titles of works, the Soviet constructed nuclear plant by name, or in quotations from other texts, I use Ukrainian transliterations of Chornobyl and Prypiat rather than the Russian transliterations.

The imposition of the reader crossing over into the place of someone else's home to peer into the mundane material of everyday life presented before them for viewing, here as a still life, sits at the heart of this article. Drawing on critical theories of haunting, affect, trauma, and memorialization, I consider how everyday objects are used by artists to document and remember the ongoing decay, death, and destruction of nuclear disaster in Chornobyl and Fukushima. Like Zabuzhkho's reader, the artists I explore here are not residents of the spaces they are in; they enter afterwards in the time of fallout, a time of aftermath that is "both material and conceptual, a way of talking about legacies and futures, toxics and natures, perceptions and misrecognitions" (Masco 2021, 24). Disasters such as the 1986 meltdown of the Chernobyl Nuclear Power Plant built by the Soviet Union inside the Ukrainian Soviet Socialist Republic and the more recent 2011 disaster at the Fukushima Daiichi Nuclear Power Plant in Fukushima, Japan, are durational. It is a slow violence that continues after the event that lingers and expands but becomes ignored; fallout time as a time of slow violence is, in Rob Nixon's words, "unspectacular time" that goes ignored "in an age that venerates instant spectacle" (Nixon 2011, 6). The artists' works I examine take this unspectacular time and present viewers with unspectacular materials from the everyday things inside the exclusion zones established around the epicentres of the Chornobyl and Fukushima reactors.

Nuclear fallout is critically "both collectively and asymmetrically distributed, marking everyone to a degree while having an intensified effect on specific communities, ecologies, and bodies" (Masco 2021, 25). These asymmetries become pronounced along lines of power and privilege, often intersecting with race, wealth, experiences of colonization, and geopolitical power; the artists I work with are internationally acclaimed and established, their turn towards unspectacular time and unspectacular everyday material rests upon their own spectatorship and spectacle. I approach these works to see how the turn towards ordinary material as embedded in the durational normality of everyday life becomes a focal point for connecting the outsider-artist to the intimacy of the space—the imperative entrance into the still-life. These familiar things become a spectral presence of felt intimacy. The half-finished sweater is haunted by someone's fingers, but the artists resist claiming and co-opting that person as their own, instead they enter this space as part of a collective fallout age while also sheltered from the intensity of its effects. The first piece I address is a collaborative memoire-essay and photography project by Michael Marder and Anaïs Tondeur titled *The Chernobyl Herbarium: Fragments of an Exploded Consciousness* (2016). The second is another

collaborative project, also from 2016, titled *Fukushima Texture Pack* by Eva and Franco Mattes. Both Mattes's work and the final work, Ai Weiwei's *A Ray of Hope* (2015), were part of the art project *Don't Follow the Wind* organized by Chim↑Pom, an artist collective started in Tokyo in 2005.

Don't Follow the Wind was a collaborative long-term project rooted in the Fukushima Exclusion Zone in "homes and places of work lent by former residents, all of which are contaminated" (Hirsch and Waite 2021, 11). The former residents are anonymous, but the project became a space of entanglement where the artists, curators, and local residents became part of a "temporary and translocal" community that simultaneously was witness to the ways in which the "contamination has displaced and ruptured communities" (12–13). While some of the artists involved in *Don't Follow the Wind* are Japanese and experienced the Fukushima disaster as tied to local intimacy, national identity, and within a lived experience of Japanese nuclear history and politics, the artists I focus on are foreign to the space and, as such, were invited in like the reader in Zabuzhkho's poem. Both Weiwei and the Mattes's relationship to Fukushima, and Tondeur's connection to Chornobyl, is more unfixed and their works reflect a desire for familiarity from a distance. They are unable to speak in the first-person and do not seek to speak as ventriloquists voicing the experiences of others. Instead, the artists turn to ordinary things that become uncanny through their duality as familiar materials of everyday life that connect the outsider-artists to the space and as unfamiliar materials of a radioactive everyday life that warp recognition and create a distance as the artists are not living nor inheriting an intimate durational experience with the zones as home. This uncanniness of defamiliarizing the familiar draws us into the 'could be dawn' time where the artists reach out to grasp at the intimacy of space but are always already in this corpuscular liminal space as visitors and strangers; here, they can only turn to the still life of their own familiar everyday now haunted by nuclear radiation and visit with the ghostly traces of other lives. All of these artists I consider here use different materials and artistic forms that have themselves different affordances for circulation and engagement. Nevertheless, they share a focused attention on the mundane materiality of everyday life as a point of affective intimacy. The unspectacular experience of slow violence becomes a still life of mundane things simultaneously rendered extra-ordinary in their saturation with radioactive contamination and utterly ordinary in their materiality as local plants, walls, and homes.

The ordinary, here, does not signal a lack of importance or value; rather the opposite, the ordinary is saturated with meaning and forms the foundational frameworks of our lives. Kathleen Stewart explores the concept of

everyday experience, feeling, relationships, and embodiment in her book *Ordinary Affect*. Here, moving between theoretical writing and memoire, she exposes the meaningfulness of mundane life. Critically, experiences of violence, loss, pleasure, longing, and other acute feelings are all included within this ordinary life. While moments of intensity, of trauma, "rise out of the ordinary and then linger, unresolved, until memory dims or some new eruption catches our attention" these are incorporated into the ordinary and become "erupting events" that draw "our attention to the more ordinary disturbances of everyday life" (Stewart 2007, 74). The erupting events of Chornobyl and Fukushima broke through the ordinary, but the ordinary settles back in and reforms around new everydays.

Stewart's ordinary affect is an inhabited world of relations, responses, interpretations, and ideologies. It can be banal, though at times it can also be entrancing, but it forms a familiar substratum that extends beyond oneself and into an everyday world of other people, other things, other animals, and other natures. Stewart writes, "[o]rdinary affect is a surging, a rubbing, a connection of some kind that has an impact. It's transpersonal or prepersonal; not about one person's feelings becoming another's but about bodies literally affecting one another and generating intensities: human bodies, discursive bodies, bodies of thought, bodies of water" (128). This ordinary space is often invisible or ignored, fading into a momentum of everyday lives, feelings, relations, and spaces; however, at moments the normalcy becomes something observed, in still life (19).

This attention to everyday space as layered with the affective intimacy of daily life has also been an area of inquiry within the field of hauntology. While the term originates with Derrida's assertion of Marx haunting Europe, the field of hauntology has grown to consider ghosts as both literal and metaphoric entities that act as remnants of the past made present (Derrida 2006). Shifting from Derrida's framing of haunting as a potentiality of past that is yet to come towards a more affective and embodied form of haunting, I take ghosts as having an ontological reality in this mortal world as beings that are forces of remembrance and voices of trauma. These ghosts tend to remain located in the spaces of intimate places. These intimate ghosts haunt in liminal places, places betwixt and between, and they also create liminal spaces by their own inbetweenness as both dead and animate. Hauntings are rooted in cultural and religious traditions and ghosts do not always move easily across the limits of our own fluencies. I take ghosts not as a metaphor, but as a theoretical framework for naming an extra-ordinary insistence of emotional, intimate, and relational presence in those uncannily everyday spaces that somehow resist the ordinary affect we associate with them and instead unsettle us

as a tingling sensation or a flash in the corners of our eyes. Michael Mayerfeld Bell proposes a view of haunting wherein "ghosts—that is, *the sense of the presence of those who are not physically there*—are a ubiquitous aspect of the phenomenology of place[.] [...] Places are, in a word, personed—even when there is no one there" (813). The examples Bell uses range from creeping into forbidden places to revisiting old haunts where his family spent their summers going to the Tower of London. What unites these different examples is a sense of place that is rooted in the ordinary affective experience of being in relationship with people no longer present, which becomes a haunting.

Some ghosts give voice to the past traumas remaining and asking for recognition of hidden, unresolved, and generational violence. Avery Gordon's *Ghostly Matters: Haunting and the Sociological Imagination* shares Bell's expansive view of haunting as an experiential and relational connection, though, for her, ghosts are always present because of harm (Gordon 1997, xvi). While Gordon's limit on the affective landscape of ghosts does not address the broader range of relational ties that entangle the presences of those not physically there to the material world around us, her insistence on trauma as a root of haunting productively anchors trauma to the ordinary world around us. In the case of nuclear exclusionary zones, the harm is omnipresent. The land bears the traces of radiation as do the bodies of generations of people. The biological citizenship of those impacted by Chornobyl and Fukushima is about place and the living beings that become entangled with the invisible traces of radiation that remain. Outside of this are the artists I consider who enter into these fallout spaces without the intimacy and embodiment of local residents and former residents. As in Zabuzhkho's poem, these guests do not share space with witnesses, but rather encounter a still life saturated with the affective hauntings of ordinary life. Through these artworks, we enter into unpopulated evacuated zones that are, nevertheless, personed.

Haunted Traces of Everyday Lives: Ghosts of Place and *The Chernobyl Herbarium*

On April 26, 1986, a series of explosions in the Number Four Reactor at the Chernobyl Nuclear Power Station damaged the structure and triggered a partial meltdown of the core. There are ranges in the estimates of the exact number of deaths and the exact amount of radiation released into the area of Chornobyl and the nearby town of Prypiat; the World Nuclear Association lists two initial deaths of workers at the power station and

twenty-eight more people in the weeks following from acute radiation poisoning with an average radiation dose of 31 mSv (millisievert) (World Nuclear Association 2022). The International Atomic Energy Agency also cites that there were twenty-eight deaths (though whether this is inclusive or exclusive of the two workers' deaths is unclear) and notes that "while 19 ARS [acute radiation syndrome] survivors died up to 2006, their deaths had been for various reasons, and usually not associated with radiation exposure" (International Atomic Energy Agency 2005). The World Health Organization claims that "fewer than 50 deaths" can be attributed to the radiation from the disaster (World Health Organization 2005). These numbers offer a minimized impact of Chornobyl on the lives, human and non-human, that were irreparably altered by the radiation. Death is not the only loss or harm we can experience; radiation has caused thousands of cancer diagnoses, general damage inherited in the bones and cells of the descendants of those exposed, and a 30 km exclusion zone demarcating the area of severe environmental damage. While Chornobyl is an epicentre of radiation, globally, after the start of nuclear weapons testing "the isotope [Strontium-90] is present in the dental makeup of anyone born after 1963" (Marder and Tondeur 2016, 38). The traces of Chornobyl and other epicentres of radioactive testing, storage, detonation, and meltdown are an everyday effect that is unevenly distributed with some experiencing death, illness, fear, or nothing at all but with shared markers of the world-altering exposures of atomic radiation from human-made sites.

Michael Marder and Anaïs Tondeur's *The Chernobyl Herbarium: Fragments of an Exploded Consciousness* provides a "humble share to a collective grappling with the event of Chernobyl [...] keenly aware that we [Marder and Tondeur] are endeavouring to think the unthinkable and represent the unrepresentable" (Preface). In this, the work provides a personal and fragmented account of the fallout of Chornobyl; we encounter plants as cuttings rather than durational and living things emphasising the sense that this is a piece of something much larger and longer than is represented here only in the part. Tondeur's images were not originally created for this volume, but exhibited and encountered by Marder, who then pursued a reframing of them as part of an "artistic-philosophical collaboration" which became *The Chernobyl Herbarium* publication (32). Alternating pages feature Tondeur's photograms and Marder's writing that moves between memoir and treatise reflecting on his own relations to Chornobyl and offering philosophical fragments on living in a fallen (fallout) world.

Tondeur's photograms were made by placing cuttings of plants on photosensitive paper and exposing them to light. The photograms trace

the imprints of radioactive herbarium specimens that are today grown in the exclusionary zone by Martin Hajduck from the Institute of Plant Genetics and Biotechnology at the Slovak Academy of Sciences (Preface). The plants are part of the new growth in Chornobyl; Tondeur's images invite us to consider the relationship between the physical specimens grown by Hajduck and their illuminated forms in the photograms as created herbaria, at once living and also dead. Critically, Marder writes, "the photograms do not represent anything. They only catalogue the traces of flowers, leaves, stems, and roots, along with the remnants of radiation trapped in them" (66). The collaboration is a dialectic between the human voice of the author and the photographer and the non-human form of the plants. This form is the voice of the plant, "Each branch, shoot, and leaf located in a particular portion of a geranium [...] is the outcome of a lived vegetal interpretation of the environment: the direction and intensity of sunlight, the amount of moisture in the air, and so forth. Plants' living forms are *their* semantic structures" (200). The plants are not symbolic or representative of something else because they are portraits of what they are. Tondeur's photograms appear as white skeletons that demarcate the physical body of the plant where it was placed on the paper. Around this white form is a sepia-toned background sometimes appearing as a watercolour-like wash of dark and light tone and sometimes dappled with dots of light like flour thrown on a countertop when baking. At the bottom of the images is a label with the taxonomical name of the herbarium specimen, the phrase "Photograph on rag paper, 2011–2016//Exclusion Zone, Chernobyl, Ukraine," and the stated radiation level in microsieverts per hour. The printed names, *Linum usitatissimum* (flax), *Baeckea linifolia* (flaxleaf heath myrtle), and *Byrsonima lucida* (gooseberry), frame the pieces as specimens that appear as pressed and mounted plants common in herbariums around the world.

Looking at the photograms, the impulse is to see the light emitted from the plants as radiation emanating from the specimens. The invisibility of radiation resists us however, and, instead, to see it we must look inside the plants and witness their adaption and absorption of the radiation. Tondeur writes,

> The silhouettes of plants are unchanged. Cesium-137 is at work. The mutation happens from the inside. Biogenetic studies on crops planted in the shade of the Chernobyl power station are revealing a subtle transformation, inaccessible to the naked eye. The core cells of the plants have undergone a transformation. It is not surprising that the

Ukrainian population, exposed to high levels of radiation, has named it *the invisible* enemy (Marder and Tondeur 2016, 73).

The plants in this herbarium are dead. Their sampling depends upon the cutting and killing of the living form. While, at times, these images appear like x-rays revealing the inside where mutations happen making the enemy visible, what we actually see are the bones of what was once living, where the plants are changing their protein structures to better resist heavy metals and adjusting their carbon metabolism in response to the environmental changes around them in the Zone (Marder and Tondeur 2016, 22).

In both critiques and interpretations of Tondeur's work, as well as that of other artists who are depicting mass destruction and death, there is a desire to interpret the plants as stand-ins for, or replacement of, human populations. In her book, *Art and Nuclear Power: The Role of Culture in the Environmental Debate*, Anna Volkmar offers a summary of "ruin porn" as "a sneering neologism attributed to writer and photographer James Griffioen that describes the aesthetic exploitation of urban decay while encouraging ethical detachment from the sites that are portrayed" (2022, 54). A characteristic of 'ruin porn' is the absence of people, disconnecting land, industrial ruin, and loss from the lives of those who lived it (Strangleman 2013). The aesthetic removal of people from documentations and representations of trauma and extreme violence is a common practice in memorialization more broadly. Jennifer Hansen-Glucklich, in *Holocaust Memory Reframed: Museums and the Challenges of Representation*, notes the removal of people from presentations of mass destruction—here the Holocaust—writing about the common exhibitionary aesthetic of the piles of shoes, clothes, rings, etc., "museum visitors begin to perceive the piles of objects as the tortured remains of the victims themselves [...] Metonymic representation contributes unwittingly to the further dehumanization of victims by reducing them to a heap of indistinguishable, anonymous objects" (2014, 135). Both the Holocaust and Chornobyl have been framed as 'unthinkable' and 'unspeakable;' and so in memorialization there is an articulated need for a new semiotic system to convey something that extends beyond our capacity to communicate and to remember the events, the loss, and the people. The framework of representation, symbolic metonyms, and memorials become graspable and speakable systems of communication. But they are not infallible. Chornobyl, Marder notes, was a site of destruction before the powerplant was built. The pogroms, the Russian Civil War, and the German Occupation saw the annihilation of the Jewish population of the area; "in 1941, the surviving Jewish residents of Chernobyl were shot *en masse* right at

the cemetery, where their ancestors were buried;" this "other Chernobyl" is forgotten and buried underneath radioactive plants, soil, debris, and rock (Marder and Tondeur 2016, 42). Memorialization as a process of creating signs and symbols to anchor collective memory and mourning can become meaningless or silencing in their representational aesthetic. In ruin porn, the removal of people is an aestheticisation that turns away from the ethical entanglements of human lives bound-up in the decaying space; in Hansen-Glucklich's critique, the standing-in of objects for people is an attempt at documenting loss, but, in actuality, reinscribes a dehumanisation and depersonalisation that is part of the violent logics of genocide.

Tondeur's photograms show the living. The plants are dead; we see only the imprint of the clippings. The living—plants, animals, and people—are elsewhere. Magdalena Zamorska, in *Weedy Materiography: Perennials, Humans, and Posthumous Intimacies*, looks at the use of plants in Tondeur's (amongst others') work to frame the fragmentary specimens as part of a "botanical melancholia" wherein the "biogenic deaths of the plants […] [are part of] the process of bewailing the loss of the material, sensorial, corporal, unique and singular *life of a plant*, and not of a species, a floral community or an abstract or generalized *plant life*" (2020, 142). John Ryan, who introduced the term *botanical melancholia*, states that "the distinction… between biogenic and anthropogenic death collapses through the interpenetration of human and vegetal living and dying" (2018, 200). While Ryan is interpreting John Kinsella's poetry, this collapsing of plant and human into a shared space of death and mourning is one of interconnected experience. Rather than a broader environmental melancholia (Lertzman 2015), this isolation of a singular plant as a specimen and fragment, Zamorska argues, allows us to foster an intimacy with the plants that is predicated on the care-filled attention of the photographer for whom the plant died, allowing the plant to gain a "'personhood' along with significance and respectability" (Zamorska 2020, 143). The singularity of the dead specimen isolates our attention on the unmoving plant—a fragment of an exploded consciousness that is unknowable in its totality—the death of one fragment does not become a memorial encompassing all the dead.

Presentations of living plants in photographs of Chornobyl often are a motif in the vast assemblage of images depicting a depopulated land that have formed an archetype of the post-apocalyptic ruin porn aesthetics. Michelle Bentley, in her article *Immersive Ruin: Chernobyl and Virtual Decay*, quotes photographer Will Wiles stating:

> We all felt we knew the place before we travelled. Photographers and the urban explorers have saturated the internet with images of the city[.] [...] Seeing its points of interest—those must-see attractions—for oneself has an unreal sense of heightened reality that leads to a nagging case of authenticity anxiety (2018, 185).

The decaying Ferris wheel, the bumper cars, the classrooms, and the water-stained posters of Lenin circulate online and in books with various frames and angles, but always speaking of the absence of people through the post-apocalyptic remnants overtaken by living plants reclaiming the manufactured spaces of Chornobyl and Prypiat.

Tondeur's photograms document something very different. It is not a world marked by this narrative of total annihilation and she "did not intend to represent the advent of an apocalypse;" Marder insists that in these photograms there "is no aesthetics of war, suffering, and death [...] Vegetal imprints on photosensitive surfaces do not repeat the violence of [...] Chernobyl. They resonate with mute suffering and give it a chance to speak, without resorting to voice and words [...] without adding or subtracting images and representations, without as much as depicting violence *qua* violence" (Marder and Tondeur 2016, 32). Unlike the piles of shoes that stand in for the dead, or the ruin porn images that crop out the affective experiences of loss and suffering that underlie the ruins, Tondeur's photos neither ignore nor represent people. They do not reach out and merge anthropogenic and biogenic death into a botanical nostalgia where we experience grief through the death of the plant. The plants, we are told, while "rooted in the ground, [where] they are of course unable to escape the harmful effects of radioactivity [...] are also more adaptable[.] [...] Their exposure *to* the world is of one piece with learning *from* the world and giving plenty of things *back* to it. Only our, human, exposure betokens pure vulnerability, passivity, helplessness" (22). Plants are living in Chornobyl and, across generations, are growing with the environment to adapt to the land.

In these ordinary lives of the plants, the *Chernobyl Herbarium* is the returning to everyday mundane life in the durational continuation of disaster. Where, after enough time, the ordinary affect takes over again and normalises and neutralises the trauma into a new every day, always saturated with the remnants of that event but moving forward; a kind of cosmic microwave background where the electromagnetic radiation from the event of the Big Bang pervades across the universe. Tondeur's plants are ordinary things. Their radioactivity makes us want to see their lighted bodies as something extraordinary, but this is just their imprint. We can

look at the leaf structure of the gooseberry and recognize the plant, we can imagine the dry spiced smell of the geranium leaves. Radiation remains unseen. It is an uncanniness that settles over the plants and photograms as a trace of something else. Tondeur insists on the particulars of space, captioning all her images with the refrain "Exclusion Zone, Chernobyl, Ukraine." The images are haunted by the place because the place has an affective presence. Bell frames ghosts of place as a way of talking about "the specificity of the meaning of place" (1997, 215). The plants are social beings living their semantic structures, these dead specimens and their photograms are now one of the "multiple afterlives" of radiation where "the imprints portend survival, the afterglow of what gives itself to sight. They reflect the lived, and outlived, meaning" (Marder and Tondeur 2016, 38). We are haunted by their ordinary affect and uncanny afterlives that are embedded in the space of the Chornobyl Exclusion Zone. Similar to the iconic "red forests" of the Zone where fallen trees remain because there are no living organisms to break them down, the herbarium images show that the dead are present but have passed into a liminal state of unsettled stasis between being destroyed and being present. The plants lived semantic structures that voice their relationship to place continues after their death, haunting Tondeur's photograms.

A Strange and Familiar Present: Still Lives and the *Fukushima Texture Pack*

The things we see around us every day can fade into a forgotten familiarity, losing affective significance unless something startles us into noticing their presence or absence. A photograph of loved ones on a wall can become mundane until it falls and the glass shatters causing a realization of all the layered feelings of care and affection that are bound up within it despite its general invisibility in the background of our daily life. The *Fukushima Texture Pack* moves back and forth between the distinct moments of mundane forgetting and careful attention of everyday sights. To do this, artists Eva and Franco Mattes "photographed hundreds of indoor and outdoor surfaces inside the Zone, including floors, tatami, walls, dirt, grass, pavements, desks and closets. [They] turned each photo into a digital, seamless texture, that can be freely downloaded and used without copyright restrictions" (Mattes and Mattes 2016). The term 'texture' here is useful to describe the nature of these photographs as capturing the surface or visual face of something ranging from wallpaper to the clouds in the sky. These images are disconnected from contextualizing landscapes,

people, or objects, instead allowing us to look at them as tactile digital images. Some, such as a Suntory vending machine or a National AM/FM radio and tape player, are suggestive of place and time, however many of these texture photographs could be anywhere. The framing of these as a *texture pack* offers an experience of them as background that emphasises the everydayness to these images—you are able to enact this experience and, for free and without copyright restrictions, can download an image and use it as a digital background, print it on textiles, or as wallpaper. Without knowing what the origin of the images are, they enter easily into an everyday mundane digital and physical landscape.

Figure 1. *Fukushima Texture Pack*, “FKS0239,” Eva Mattes and Franco Mattes (2016).

The *Fukushima Texture Pack* was created as part of the larger collaborative art project titled *Don’t Follow the Wind*, an exhibition installed inside the Fukushima Exclusion Zone that features twelve artists’ (and art collectives’) works that are largely inaccessible as long as the Zone remains closed to the public. Some artworks can be viewed partially or in certain ways from a distance, such as the *Fukushima Texture Pack*. However, other pieces remain unseeable; in the case of the *Fukushima Texture Pack*—in addition to the digital images—Eva Mattes and Franco Mattes installed

plexiglass panels over the surfaces where the images were taken which are not currently accessible to would-be audiences. The panels are transparent with an identification number etched on them reading, for example, "FKS0101" on what appears as a piece of rusted corrugated metal roofing (Mattes and Mattes 2016). These panels are all located within the Fukushima Exclusion Zone created after the Fukushima Daiichi Plant disaster in March 2011. Following a 9.0-magnitude earthquake that triggered a tsunami, the reactors at the plant were flooded and the backup generator was damaged; this caused the cooling systems to shut down leading to a build-up of heat and a meltdown and explosion of reactors one and three on March 12 and 13, 2011 (Britannica 2022). After this, the Japanese government evacuated people from a 1150-km2 area split into three categories, one that was to remain abandoned for the foreseeable future and two that were "remediated" and allowed for resettlement (Lyons et al. 2020, 127). Over 100,000 people were evacuated with the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) reporting: "No radiation related deaths or acute diseases have been observed among the workers and general public exposed to radiation from the accident" (International Atomic Energy Agency 2015, 132). With no claimed deaths, the Exclusionary Zone is seemingly denied the ghosts that Avery Gordon discusses who narrate trauma and give voice to stories of harm. The evacuated landscape of the Fukushima Exclusion Zone is unpeopled by the living and the dead.

Like the Chornobyl Exclusion Zone, images of the abandoned landscape now circulate online, though, unlike Chornobyl, the destruction from the proceeding natural disasters makes this Zone seem more destroyed than frozen in a living (but now past) time and the visuals do not share as much as they might first appear to the viewer after arrested attention. Because Chornobyl remains so steadfastly lived-in with its buildings and things *in situ* (though perhaps now more as props than accidental remains), the aesthetics of it as a post-apocalyptic space seem more like the Evangelical imagining of the rapture-moment where people are vanished from the world prior to the second coming of Christ leaving behind their worldly materials as they are snatched-up *in media res*, as it were.[2] Fukushima, in contrast is often pictured as a wreckage; abandoned and destroyed homes, streets, cars, and fields are left in rubble and pieces. The images of the *Fukushima Texture Pack* "do not depict the disaster, they 'come' from the disaster, evoking it, and carrying a sense of incomprehension of the event" (Hirsch and Waite, eds. 2021, 64). Like the herbarium plants, the images do not replicate or repeat the violence of the disaster but turn to everyday pieces from the Zone that are saturated with the sense of place

2 For a popular media presentation of this eschatological conceptualization see LaHaye (1995).

and familiarity neither replacing nor replicating the totality of the event or the lives experienced therewithin. Looking at them we stand in relation to the ghosts of place, not predicated on or romanticising the actual dead, of which UNSCEAR assures us there are none.

The textures are designed to circulate. The potential usage of the textures disconnected from their origin as irradiated surfaces inside the Fukushima Exclusion Zone is a line Eva Mattes and Franco Mattes are interested in tracing. The website with the textures available on it requests users to reach out: "We are curious to know what the textures are used for. Please do share your results by emailing us" (Mattes and Mattes 2016). D. M. Bothwell and P. A. Stewart, in the chapter "Knowledge Exchange and Knowing: The Self, Art Practice and the Digital," connect the *Fukushima Texture Pack*, drawing here on Anaïs Nin's work, to a practice of defamiliarization, wherein art has the capacity "to take the everyday and make it strange" (Bothwell and Stewart 2020, 287). This defamiliarisation is akin to the emotional shifting that Stewart described as the moment of "still life" when the background everyday normalcy is interrupted by a stilled focus that changes something about how we perceive the space. Like Zabuzhko's still life, the recognizable things around us become objects of focused attention; Juan Sànchez Cotán's *Still Life with Quince, Cabbage, Melon, and Cucumber* (1602) focuses the viewers' attention on the verdant cabbage and quince suspended from strings above a table where a cut melon and cucumber sit facing outward towards us as if waiting to be picked up and consumed. In the *Fukushima Texture Pack*, the still life is the frozen attention on the familiar black dots on the white ceiling tile or the similar tile with a mounted florescent light.

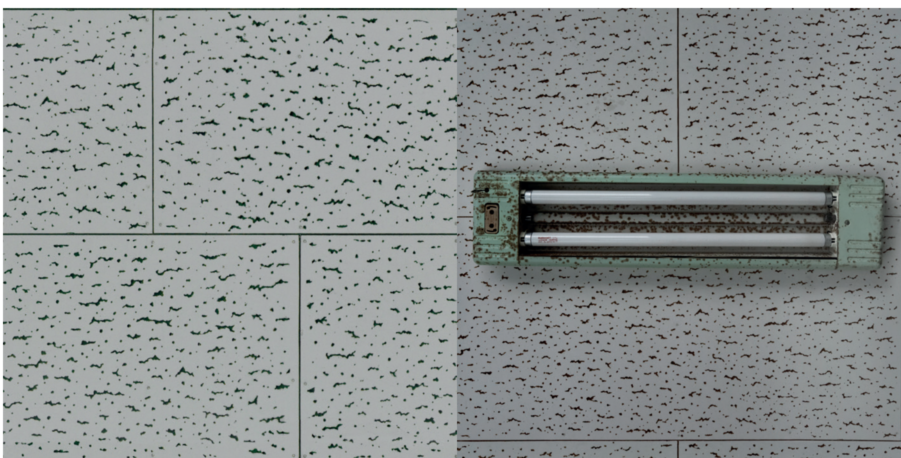

Figure 2. *Fukushima Texture Pack*, "FKS0115" and "FKS0116," Eva Mattes and Franco Mattes (2016)

Within the space of the *Fukushima Texture Pack*, the defamiliarisation is reversed — the space is unfamiliar as an exclusion zone that forced the severing of everyday ordinary affective relationships with these familiar things. The still life takes the everyday and makes it strange; here the images' mundane textures are known to be contaminated surfaces, but this can slip into the background as they become familiar and circulate beyond their original context. For Stewart, the hyper focus on the still life object is what renders it unfamiliar, but here this is reversed and it is the background space that instead renders the stilled object unfamiliar and uncanny when it is brought forward into the viewers' attention. Here, the familiar is itself haunted by the persistence of contamination and, simultaneously, the contamination is haunted by the persistence of familiar space that is meaningful within the ordinary affective lives that extend beyond the Zone and the durational experience of fallout. The Mattes's work plays with our sense of familiarity; I look up from writing this article and see my own office ceiling with its own white and black speckled ceiling tiles. The everydayness of this texture reminds viewers that a nuclear event causing radioactive contamination could occur anywhere, though the experience of disaster is unequally valued as are the lives effected by it (Nixon 2011, 65).

Figure 3. Photo of the Author's Office Ceiling (2022)

Bothwell and Stewart push the idea of defamiliarisation forward into a discussion of Mark Fisher's work on Derrida's concept of *hauntology* (a portmanteau of haunting and ontology) to discuss how the present is

always configured through what is not, either as a *not yet* or a *no longer* (Fisher 2012, 18–19). The liminality of the present framed through *what is not yet there* and *what is no longer there* becomes a fertile ground for ghosts who like to inhabit these betwixt and between spaces (Davies 2009). The textures stand in relationship with us and invite our own affective attention to draw them towards ourselves for our own uses. Their ubiquity and open-access status is contrasted with the locational specificity and immobility of the plexiglass plates in the Exclusion Zone. The origins of these images are rooted in the space of Fukushima and they take on an uncanniness as their ordinariness creates a liminal space that destabilizes the images and asks us to freeze our gaze on the detailed still life of a florescent light. Freud popularized this notion of the uncanny, which in German roots us in the familiarity of home with the term *unheimlich*, literally not-home-like, though translated as 'uncanny.' Freud defined this feeling as belonging to "that class of the species of the frightening that goes back to what was once well known and had long been familiar" (Freud 2003, 124). This liminal inbetween space flips our expectations of hominess, our knowledge of what these images are (where they are at home and familiar) within the Exclusion Zone—a place seemingly set outside of ordinary affect and everyday things—the uncanniness and defamiliarisation occurs when we recognise in them our own familiarity and our own invitation to reuse these images as open-source textures. The texture pack sits in an uncanny twilight space where familiar things take on new shadows and the edges become blurred. Ghosts like to move through these liminal spaces and crepuscular times. Here, these are not the ghosts of the dead, but the ghosts of an abandoned everyday in an evacuated zone, this haunting reasserts an ordinary affect over the AM/FM radio and the ceiling tiles that is both at once home-like and not-homelike (Mitchell and Petty 2020, 401–409). In turn, our ordinary affect is haunted by the place of origin, by our imagination of the erupting event at the Fukushima Daiichi Plant that seemingly ended the possibility for an ordinary mundane in the Zone and for the people who live surrounded by these everyday textures.

While its nature is changing due to the levels of radiation in the Zone, *Don't Follow the Wind* was conceptualised as an exhibition that no one could visit; it was in the present, but framed through what was 'not yet' and 'no longer' and, as such, simultaneously not yet and no longer at safe radiation levels for people to visit or return home. As of 2022, after "[m]ore than a decade has passed since the earthquake, and the *Don't Follow the Wind* venue is now open to the public, as the evacuation order has been lifted in August 2022" (*Don't Follow the Wind* 2022). As of right

now, Meiro Koizumi's *Home* (2015) will be "re-created and expanded on the site" now open to the public for sixteen days, with the note that "this venue will not be included when another venues [sic] open in the future. There is no known time when the other works inside the zone will be accessible" and all identifying maps, locations, and documents are not to be circulated (Don't Follow the Wind 2022). In contrast to this, Eva Mattes and Franco Mattes's works invite circulation and exist simultaneously inside and outside the Zone. We look at the textures and see our walls, streets, roofs, skies, and ceilings. When we look for too long, they morph into something defamiliarised, holding the still life moment and allowing the mundane to become the subject of focused attention that extracts it from the everyday and makes it into something affectively full.

Home: *A Ray of Hope*

Heimlich, home-like, is not without its own ambiguities; it is a vast space of ordinary affect that can be a comfort and a containment. Ai Weiwei's *A Ray of Hope* (2015) is a light installation in a single house inside the Zone that has solar power lights, which turn on for a total of five hours every day, once in the morning and once in the evening "when the residents—who are no longer present—would normally be home" (Hirsch and Waite, eds. 2021, 256). Like a lighthouse, the light beckons home those who lived here, though no one can see it, it signals a way back, hoping and "waiting to be rejoined in the future with a chorus of accompanying lights and those who will return" (256). The house becomes the only source of emitted light in the abandoned houses of Fukushima appearing as a warm yellow glow coming from the windows. *A Ray of Hope* projects forward and calls out to those who left; the hope of return is surrounded by the destruction of the houses and the darkness that surrounds it at night. In his review of the *Don't Follow the Wind: Non-Visitors Center*, the satellite exhibition at the Watari Museum of Contemporary Art in Tokyo inn September 2015, Kenichi Kondo sees *A Ray of Hope* as having "a ghostly resonance with the outspoken artist-activist's [Ai Weiwei's] experience of being grounded in China for four years, after the government confiscated his passport in 2011" (2016, 154). Ai Weiwei makes this connection as well in his second installation, *Family Album*, where he had personal photographs documenting aspects of his life placed in two other houses in rooms where other people once lived. Weiwei, living under house arrest and unable to travel to Fukushima, authored the installation from China.

The photographs include a range of material including images from the investigation of the 2008 Sichuan earthquake, images of him being followed and surveilled by the police from 2011 to 2012, images from his surgery following police attacks that injured his head, and family photos from 2011 to 2013 (Weiwei 2015).

Ai Weiwei is both present and absent from the houses, which appear both abandoned and active as homes. Unlike the *Chernobyl Herbarium* or the *Fukushima Texture Pack*, *A Ray of Hope* and *Family Album* are not focused on taking and circulating fragments of an irradiated land; instead, the insistence on place is emplaced on the land of the Zone itself but rooted to the intimacies of everyday home life therewithin. *Family Album* uses images of people, specifically by referencing and inserting Ai Weiwei's life into the house, by using his own photographs and placing them next to those left by the families as they evacuated their homes. Weiwei's selection of images that document state violence, misinformation, and disaster also suggest an alternative view of the disaster itself. This is not the aesthetics of ruin porn or post-apocalyptic abandonment; this is the loss of home and an exploration of the interactions of self and state that co-configure the lived experiences of mass destruction. Jacob A. C. Remes and Andy Horowitz argue in *Critical Disaster Studies* for a conceptualisation of disasters not as isolated events but as political and durational experiences that are then packaged, interpreted, and narrated as "interpretive fictions" (Remes and Horowitz 2021, 2). This fiction is not a denial of the disaster, but rather a recognition of the discursive productions around them. In a 2011 interview, Ryuta Ushiro from the Chim↑Pom collective stated that once the Zone was closed "what you saw on television were images [of the plant] shot from outside the 30-kilometer zone but digitally made more clear [sic], and the press only carried comments from the government. But it was really unclear what was going on inside" (PBS, no date). Ai Weiwei's work connecting and documenting the 2008 Sichuan earthquake was rooted in the missing and skewed view presented in the Chinese media; he described the impacts of this on him by stating, "If you cut into a tree and look at its rings, you can see certain years have left more of a mark in the wood. That's what the Sichuan earthquake did to me" (Weiwei 2018). Connecting these two earthquakes in his art, Weiwei and Chim↑Pom ask us to confront the roles of the media and the government in circulating and silencing the interpretive fictions that narrate and represent the disasters. Here, there is an insistence on the duration of the disasters as continued and inhabited ongoing traumas.

The peopling of the house is both an insistence on the everyday lives of the families at home, but also the lives surrounding the Zone that configure, interpret, document, obscure, and become informed by the disaster. The houses may illuminate the darkness directing people home, but they also ask us to place these in a political and social world. Ryuta Ushiro argues that art is not powerless in the face of disaster and overwhelming reality, it can "walk parallel paths" with the press (PBS, no date). Weiwei's work has addressed the censorship and state control of media, and his work posits a more ambiguous relationship. Weiwei's houses insist that as "news of Fukushima becomes more sparse [sic], yet while the ongoing crisis continues, this light [in *A Ray of Hope*] also activates a critical imaginary. We might not hear about the precise state of the zone or its contamination levels, but we do know that the daily ritual of the beacon continues to illuminate the darkened zone" (Hirsch and Waite, eds. 2021 256). Weiwei's houses insist on Fukushima being another deep indented time in the tree rings, with durational and historical connections that shape how we understand what a disaster is and how is reorders lives.

Ghosts reorder the temporality of life; they challenge a teleological framework of mortality, and they return, repeat, reanimate, and renew their lives often within familiar places and things. The house, as a primary site of haunting becomes a space where ghosts can "become part of the temporal continuum, of the accumulation that makes the house what it is" (Lipman 2014, 74). Weiwei's beacon and photographs reach back to lives lived and forward to lives to be lived inside the houses in the Zone. The houses mourn, hope, illuminate, and document disasters. Carol Lipman, in *Co-Habiting with Ghosts*, argues, "the haunted home is a *bounded* place with a particular presence which is made up of a complex mixture of spatial and temporal elements; a rooted, animated depth" (193). It contains within it a heterotopia of times, people, trajectories, affective experiences, and desires (195). The populating of the homes with people binds them to the Zone and insists upon the ordinary lives that were lived everyday therewithin. Once there, the ghosts are inside their home, inside the everyday affective lives lost in the evacuation. The haunted home is uncanny, it defamiliarises that which is often most familiar. It is not taking the destroyed and abandoned homes as post-apocalyptic, but rather as 'no longer' and 'not yet' inhabited by non-ghostly lives. The disaster is durational, but the memory of a lived-in past and a hope for returning in the future allows the houses to sit in a liminal space populated with people who were and will be there.

Ordinary Hauntings and Nuclear Ghosts

Ryuta Ushiro described nuclear destruction connecting Fukushima to the memories of Hiroshima and Nagasaki stating in an interview, "the ghost towns we'd seen in anime and sci-fi suddenly became a reality" (Trezzi 2022). Ghost towns are abandoned, homes left, industry gone, and haunted by the everyday lives that were lived there. Even when empty, ghost towns remain peopled. Ushiro's ghost towns are not the ruin porn or apocalyptic imaginary of a verdant pastoral landscape where artists and documentarians can picture a destroyed or abandoned space free from the people, relationships, lives, and affects of the missing. Adrianna Petryna, in *Life Exposed: Biological Citizenship after Chernobyl*, argues, "[i]t is ironic that we have better knowledge about recovering ecosystems of the Chernobyl dead zone—where a herd of rare and ancient Przewalski's horses now run wild—than we do about recovering people and human conditions on the ground" (2017, xxvii). Her book focuses on the human lives impacted by radiation, recording "people on the ground are refusing to be stratified out of existence. They refuse to disappear" (xxviii). The "decidedly nonpeopled approach" to nuclear disaster and to mass destruction more broadly, becomes an ethical issue of how we stand in relationship with the dead and with disaster (xx). The framework of unknowability and incomprehensibility can become justifications for avoidance. Remes and Horowitz caution readers: "by defining certain experiences as exceptional and others as normal, conventional thinking about disaster has too often set limits on our social imaginations" (2021 8). The artworks I consider here seek to think about disaster without replicating the violence of nuclear radiation. Rather than placing the aftermath of the nuclear meltdowns as exceptional, these artists draw us into a normal aesthetic where our sense of loss is rooted in the relationship to everyday life and ordinary affect—living room lights, windows, local plants, and ceiling tiles. The living refuse to disappear from their homes even as they are no longer and not yet living there.

Officially, there are few dead to populate these Zones as ghosts; Petryna articulates the politics and invented fictions in the official statistics from Chornobyl and Fukushima that minimize the dead and dying by factoring away long-term biological and genetic impacts of radiation. However, we do not need the dead to encounter ghosts. Ghost towns, as Ushiro names, are often associated with abandonment rather than apocalypse. Popularized as a term in the early 1900s, it was associated with the American West (Procházka 2007, 67). Mining towns, oil towns, mill towns, car manufacturing, industries that draw people to a place can collapse

leading to the exodus for those who can and choose to leave. The haunting is rooted in the lost ordinary affective life, here tied to the memories of economic prosperity, industry, and community (Stern 2019, 213–247). Unlike the abandoned ghost towns of industrial settlements, the abandonment of Chornobyl and Fukushima was an evacuation and inextricably tied to the threat of radiation and death; nevertheless, there is a shared haunting of a space in the remnants of a still life of a now-gone everyday mundane life. The nuclear ghosts in the Exclusion Zones are parts of lives, embedded and traced in the clippings from plants, linoleum tiles, and the five hours of illuminated home. The power of ordinary affect reaches across these works as an *unheimlich* force that asks us to mourn and stand in relationship with the extracted moments that are defamiliarised even as we look at them and know them. The uncanniness of being asked to look at a still life haunts us with the lives that extend beyond that singular fragmentary moment. Regardless of whether they are dead or alive, the ordinary affect of those who lived in the Zones haunts the space and saturates it with ghosts just as the contamination of radiation haunts that same ordinary affective life as an uncanniness in still life. These artworks draw us into relationship with the ghosts of those who no longer and not yet lived with everyday plant life, still life, and home life.

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K. M. Ferebee

"A New Chernobyl": Narratives of Nuclear Contamination in Russia's 2022–3 Ukraine War

Abstract: In January 2020, I visited the Chornobyl Exclusion Zone as part of research into contemporary narratives that characterized the Zone as a post-human area of timeless and infinitely abundant nature. By the time the resulting paper appeared, however, war had altered the stories being told about the Zone. As I wrote in an afterword, media narratives of the Russian invasion of Chornobyl transformed radioactivity itself into a natural and national part of the Ukrainian landscape, one that was by turns vulnerable (in need of defense and protection) and vengeful (punishing Russian intruders). But what does it mean for anthropogenic radioisotopes to be either 'natural' or 'national'? How might such narratives destabilize readings of the nuclear as inherently disruptive and alien? And does this destabilization make possible new understandings of the Anthropocene as an era defined by the dispersal of anthropogenic radioisotopes? In this paper, I engage in close analysis of media narratives surrounding the Russian invasion of Chornobyl, drawing on both the nuclear humanities (particularly Joseph Masco's work on the "nuclear uncanny" and Kate Brown's history of Chornobyl) and human geography perspectives on the constitution of place. I ask what affordances emerge from a view of radiation as other than contaminating and what dangers might be present in the same claim.

Keywords: energy humanities, nuclear humanities, environmental humanities, Chernobyl

Introduction

When Russia launched a full-scale invasion of Ukraine on 24 February 2022, there was little question that a new era of nuclear anxiety and negotiation had begun. Not only did the invasion and the West's financial and military support of Ukraine raise the possibility of Russian nuclear warfare, but the fraught relationship between Russia and Ukraine has long been entangled with the history of nuclear power. The 1986 Chornobyl[1] Nuclear Power Plant accident, which poisoned and/or permanently displaced hundreds of thousands of Ukrainians and contaminated a large area of what is now Ukrainian land, is strongly linked in the Ukrainian national imaginary to subjugation by Moscow and the birth of post-Soviet Ukrainian national identity (Dawson 1996, 67–79). At the same time, post-Soviet Ukraine's capacity to produce and control nuclear power has become a significant site — especially in the context of successive political revolutions that emphasized a movement away from Russian ties and Soviet practices that was also a movement towards Europe — at which the nation stages its socio-technological modernity and independence from Russia, particularly given the potential of nuclear power to liberate it from energy dependence on Russian gas (Dawson 1996, 81; Kasperski 2015). It's therefore not surprising that the nuclear emerged immediately as a prominent part of the Ukrainian war narrative — first with the capture of the Chornobyl Nuclear Power Plant and surrounding territory by Russian forces on the first day of the invasion, and secondly in the long tension surrounding control and maintenance of the Zaporizhzhia Nuclear Power Plant after its seizure by Russia in March 2022.

What *is* surprising is the way in which Ukraine's nuclear landscapes have been refigured through their mobilization in the ongoing war narrative. Previously, Chornobyl and its irradiated "Zone of Exclusion" have appeared as a site of national injury where Ukrainian identity and heritage themselves were subject to contamination and destruction. They have also functioned as a site at which (chiefly Anglophone) anti-human fantasies of ecological resilience can be staged in ways that relieve and sustain the Anthropocene. In media narratives of the 2022 war, however, Chornobyl emerges at multiple points as a site *of* Ukrainian identity; a Ukrainian identity that nonetheless incorporates the wound of toxicity as part of its own national-ecological body while negotiating toxic suffering in the context of other concerns. Here, I explore how such a negotiation runs counter to established 'toxic discourse,' and contrast it to the way that 'Chornobyl'-as-signifier is used transnationally to articulate Anthropocene anxieties and obscure non-toxic moral demands.

1 In keeping with current Ukrainian preferences, I have chosen to transliterate the site of the 1986 disaster as 'Chornobyl' where not directly quoting or referencing sources that use 'Chernobyl.'

Another Chernobyl

On the first day of the February invasion, Russian forces entered the Chornobyl Exclusion Zone, an approximately one-thousand-square-mile area where human activity is highly restricted due to lasting radiological contamination from the 1986 accident at the Chornobyl Nuclear Power Plant. By nightfall, the Russians had seized control of the power plant. Throughout the following month, anxiety propagated regarding the status of the power plant and its Ukrainian staff, as well as the activity of Russian soldiers within the Zone; the Russian capture of the Zaporizhzhia Nuclear Power Plant, following clashes between Russian and Ukrainian forces that resulted in a fire near the power plant on 4 March, intensified the circulation of conflicting risk reports. It also intensified the circulation of Chornobyl rhetoric; invocations of Chornobyl as historical memory, as material site, and as specter of the future. International news media abounded with warnings of a “second Chernobyl” (Millard and Smith 2022) or “another Chernobyl” (Harshaw 2022; CBS/AFP 2022; Meshkati 2022) in spite of debate about what level of risk the Russian attacks actually posed (Gordon 2022). In late July, conflict around the Zaporizhzhia plant reignited, leading to a new wave of fears about “another Chernobyl” (Olson 2022) or a “new” (Shinkman 2022) or “second Chernobyl” (Bishop 2022), in part seizing on remarks to this extent by Turkish president Recep Tayyip Erdogan (Strozewski 2022).

This rhetorical mobilization of Chornobyl was not confined to international news media. During the attack on Zaporizhzhia in March, Ukrainian president Volodymyr Zelenskiy gave an address on Telegram and Instagram in which he called on “all Ukrainians and all Europeans, all people who know the word *Chernobyl*” (Borger and Henley 2022) to raise alarms about the situation. Later, in an address broadcast on the 26 April anniversary of the Chornobyl disaster, Zelenskiy (2022b) suggested that Russians “do not comprehend what Chernobyl is, in the least bit,” or that — in contrast to Ukrainians, who remember — they had “forgotten what Chernobyl is.” The word ‘Chernobyl’ really ought to be demarcated in brackets in here, as Olga Bryukhovetska opts to do in order to emphasize the way in which the name has become a “nuclear signifier,” a “knot” of “multiple avenues of meaning” that “acquire[s] different, sometimes opposite, meanings with the changing historical moments” (Bryukhovetska 2016, 97–98). Courtney Doucette (2019), too, observes how the name “Chernobyl” emerges again and again as invested with varying types of meaning; astutely, she suggests that new Chornobyl texts, including the recent HBO miniseries, send “clear messages about the significance of the event for the present” (842) at the

same time as this significance is sometimes built upon fantasy rather than history (845). The polysemy of 'Chernobyl,' as well as the affective power it possesses as a symbol, means that we must closely interrogate what it actually *does* mean to "know the word *Chernobyl,*" and what invocations of a "new Chernobyl" actually suggest.

For Ukrainians, Chornobyl occupies a significant role in the national imaginary. Adriana Petryna, writing in the context of the current conflict, suggests that the Chornobyl disaster inflicted a kind of collective trauma on the people of Ukraine, one that is closely linked to or even indistinguishable from material damage: "the memory of the explosion is carved into Ukraine," she argues, and Russian invaders are "stirring up radioactive particles and also Chernobyl's painful legacy" (Petryna 2022). In her account, Russians trespass into the ground (both physical and metaphysical) of Chornobyl — the "violent encounter between 'Chernobyl invaders' and Chernobyl survivors" — is "its own act of aggression." In many ways, this aligns with the narrative of Chornobyl that is presented in Kyiv's National Chornobyl Museum, where the accident is both national and nationalizing tragedy. The museum's logo (Figure 1.) features the so-called 'Partisan's Tree,' a large pine near the Chornobyl Nuclear Power Plant where Nazi invaders hung Ukrainian partisans during the Second World War; in the logo, the tree appears as a deathly silhouette surrounded by ghost apples, while the bright living apples themselves hover in darkness to the tree's left. Throughout the museum, the apple tree functions as an emblem of the (again both physical and metaphysical) Ukrainian national body, its broken branches symbolizing both a loss of heritage and damaged biological fertility (Ferebee 2022). The twinning of the apple tree and the partisan pine in the logo links this "broken" national body to an image of eternal-but-wounded Ukrainian resistance.

The anthropologist Yaroslava Yakovleva (2014) is among those who argue that the centrality of agriculture and 'native land' to Ukrainian culture has influenced the Ukrainian experience of Chornobyl as a cultural shock. The forced displacement of hundreds of thousands of inhabitants from their native Polesia as a result of the disaster caused lasting trauma. But, more broadly, the alteration and sudden unfamiliarity of the Polesian environment caused Ukraine to become alienated from its own material terrain (Bryukhovetska 2013). This interpretation is still present in many narratives of Chornobyl; a 2022 *New York Times* piece (Bubola and Kuznietsova) that interviews Chornobyl survivors about the recent nuclear threat presents the Polesian terrain around Chornobyl as irrevocably lost to its prior inhabitants. "When I visited my native village [after the accident]," a survivor recalls, "my heart ached the same way." In other words,

Figure 1. The logo of the National Chernobyl Museum in Kyiv, 7 January 2020 (K. M. Ferebee, photo of Chernobyl National Museum from the author's personal collection)

though the village is still present, it is also *not* present; the change that it has suffered is too abrupt and radical.

This narrative aligns with that presented by Ukraine's National Chornobyl Museum, where the irradiated territory of the Zone is figured as an injury to the very heart of what it is to be Ukrainian. Notably, the museum expends huge amounts of space on displays that connect traditional rural handicrafts and religious faith to the disaster: paintings of angels in the style of Orthodox Christian icons are juxtaposed with the protective uniforms of Chornobyl liquidators (Figure 2.), and the names of abandoned villages line a processional hallway that is draped in *rushnyky*, a traditional form of embroidered cloth (Figure 3.). The lost or 'broken' land of the Exclusion Zone becomes identified here not only with Ukrainianness, but with a vision of Ukrainianness that is opposed to the Soviet goals of modernization and atheism. In Pripyat, as in other Soviet "nuclear cities," there were no churches, though many inhabitants maintained religious faith (Boltovska 2019, 464–5).

Figure 2. An image of Kyiv’s National Chernobyl Museum in which an Orthodox angel and a Chernobyl liquidator’s uniform are posed similarly on opposite sides of an archway, 7 January 2020 (K. M. Ferebee, photo of exhibit at Chernobyl National Museum from the author’s personal collection)

At the time of the National Chornobyl Museum’s founding, in April 1992, this vision was more representative of popular Ukrainian understandings of Chornobyl. In post-Chornobyl Soviet Ukraine, the anti-nuclear movement that emerged in response to the disaster was closely connected to what Jane Dawson describes as “the resuscitation of Ukrainian national identity” (1996, 79). Indeed, Dawson argues, the anti-nuclear movement was “a catalyst for nationalism” (ibid). The entwinement of anti-nuclear and national independence movements was facilitated by a sense that nuclear power was Moscow-based and imposed (with its attendant risks) by Moscow upon Ukraine (Dawson 1996, x; 67). Additionally, the nuclear city of Pripyat was populated by largely Russian-speaking migrant workers with a distinct identity: “young, ethnically and culturally mixed, Russified, and prosperous” (Boltovska 2019, 464). While many of these workers possessed strong ties to family homes in rural Polesia, the city itself—as modern melting pot—materially represented, to some extent, a Soviet modernity that intruded upon and threatened traditional rural life. The accident at the Chornobyl NPP resulted in the displacement of many thousands of Polesian villagers from their rural homes and the way of

Figure 3. The hallway of lost villages in the National Chernobyl Museum, Kyiv, 7 January 2020 (K. M. Ferebee, photo of hallway in Chernobyl National Museum from the author's personal collection)

life associated with those homes; neatly supporting a narrative in which radioactivity and Russian rule represented a dual and intertwining force of violence against the physical and metaphysical purity and wholeness of a 'natural,' pre-Soviet Ukraine.

Yet in the years following Ukrainian independence, that narrative has been complicated in several ways, as independence meant, Dawson notes, that "nuclear power no longer represented Moscow's dominance in Ukraine; instead, it came to symbolize Ukraine's potential to sustain itself as an independent and self-sufficient country" (1996, 81). The Soviet perception of atomic power as symbol of modernity — the "key to overcome economic and political weaknesses and insure a bright national future" (Kasperski 2015, 57) — remained influential in Ukrainian attitudes towards

nuclear power. When nuclear power was decoupled from Muscovite rule, the anti-nuclear environmental movements that had been entwined with independence lost a great deal of their momentum (Dawson 1996, 81). Nuclear power itself now promised a new form of independence: independence from Russian oil and gas (Kasperski 2015, 64–5), on which Ukraine (like much of Western Europe, in ways that would become problematic during the 2022 conflict) was heavily reliant. This shift in attitudes renders Chornobyl, as historical memory and material site, somewhat ambivalent: it cannot function as Russian-inflicted national injury and wound to Ukrainian nature (or Ukrainian naturalness) if Ukraine itself is imagined as a nuclear nation. So then: how can it function instead?

A New Chornobyl

One of the most curious Chornobyl documents to appear in the early days of the 2022 war was an interview in the fashion magazine *Harper’s Bazaar* with a former Chornobyl tour guide, Lara Graldina. Graldina, who is also a model, took part in a photo shoot for the magazine in which she wears a #Chernobyl Hero’ t-shirt. She describes Chornobyl as “the most vulnerable part of Ukraine,” a part of Ukraine that has been “betrayed by [Russia-allied neighbor] Belarus” (Pendlebury 2022). Seemingly reluctant to have left behind her job — she says that she has taken up smoking, because “if [she] can’t work at Chernobyl, [she] need[s] something new to damage [her] health” — she makes a rather striking comment: “[I]t wasn’t radiation that stopped everything for me, it was Putin” (ibid). Chornobyl appears as toxic, but toxic in a way that is welcome and desirable, in contrast to the unwelcome violence of the Russian invasion. It is part of a Ukrainian “everything” that Russia seeks to destroy.

The Ukrainian author Markiyan Kamysh, whose memoir of his illegal travels in the Chornobyl Exclusion Zone appeared in English in 2022, portrays Chornobyl similarly in a March 2022 piece for *BOMB* Magazine, which he titled “On Ukrainian Chornobyl, which we have lost — for now.” Not only does Kamysh describe Chornobyl as “lost,” echoing Graldina’s attribution of vulnerability, but he wavers between nonhuman and human (female-gendered) characterizations. He has dedicated his life to the Exclusion Zone, he writes. “Now I don’t have it anymore. The Russians took her yesterday.” Like Graldina, he openly acknowledges that this “beautiful” Chornobyl is toxic while also embracing its toxicity. His father, he explains, was a Chornobyl liquidator who died of radiation-related thyroid cancer when Kamysh was fourteen. Kamysh’s vision of the Zone is consequently

realistic — wrecked, radioactive, and unpleasant — yet, also, written rhapsodically. In his memoir, he writes that he and other illegal "tourists" who wander the Exclusion Zone "seek out the most contaminated sleeping spots, much on sand from the [highly radioactive] Red Forest, and rummage in boxes full of radioactive junk[.] [...] Radiation fetishism serves as a ceremonious rite of initiation into the caste of idiots" (2022b, 50–1). This is almost certainly exaggeration, but it is exaggeration that becomes interpretable when Kamysh describes habitually drinking water from the Zone: over five years and thousands of miles, he writes, "[he's] absorbed all the poison, all the background radiation and the radionuclides of Chornobyl Land, which has long become [his] home" (2022b, 51). How else to affirm one's identity when that identity is profoundly marked by toxicity than to defiantly embrace the toxic, even to the point of mourning its loss?

In these texts, there is a sense that it is not only the space of Chornobyl but its very toxicity that is deeply Ukrainian and to be defended. It is interesting to read, through this lens, the media coverage and memes that emerged from Russia's occupation of Chornobyl, much of which focused on the likelihood that Russian soldiers had, in their ignorance of the area, only succeeded in poisoning themselves. The most factual versions of this media narrative centered on lack of Russian preparation (including lack of protective gear for soldiers) and the extent to which Russian forces had traveled into highly radioactive areas and stirred up large volumes of radioactive dust (Reuters 2022). However, more comic and sensationalized versions abounded: "Russian mutants lost this round of [Chornobyl-themed video game] @stalker_thegame," the Ukrainian Defense Ministry tweeted, suggesting that "losses caused by... radiation exposure" were a major factor in Russian withdrawal (Chappell 2022). Widely-circulated internet memes depicted, for instance, cartoon Russian soldiers with melting faces (Figure 4.) or images of radiation warnings in the Zone with superimposed text that mockingly wished Russians good luck (Figure 5). The manner in which these memes figure the landscape and even the radioactivity of Chornobyl itself is as resisting occupation. Radioactivity is, this discourse suggests, not an alien and violent imposition upon the territory of Ukraine, but in fact Ukrainian or, in some sense, 'fighting on Ukraine's side.'

Such a suggestion should not be taken as dismissing or minimizing the dangers of radioactivity. Rather, it suggests a sense of intimacy with these dangers that has complex roots and more complex effects. Thom Davies, discussing Ukrainians who continue to eat wild food from contaminated areas, points out that many of those who do so know the risks of radiation, as they, like Kamysh, have close personal connections to those who

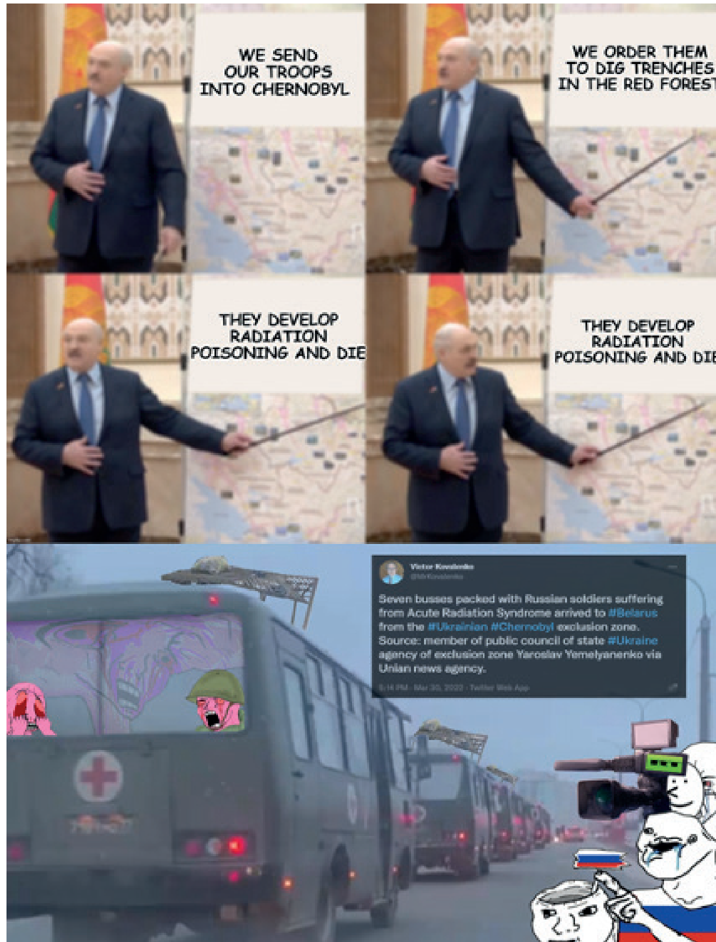

Figure 4. Two memes. The top meme shows Alexander Lukashenko, the president of Belarus and noted Putin ally, at a 1 March 2022 security council meeting where he appeared to reveal Belarussian-Russian plans to invade Moldova and expand troop presence in Ukraine. The format of the meme references another popular meme: a four-panel format in which the animated supervillain Gru, a character in the *Despicable Me* film franchise, appears in each panel pointing to a chart outlining his evil plan. The fourth panel typically features Gru realizing a fatal flaw in his plan.

have suffered serious health effects (2018, 2). Petryna describes the case of a Polesian woman whose husband as well as her son suffer from severe Chornobyl-related health problems, and who herself begins to experience health effects from her work at Chornobyl, yet who resists state warnings regarding the consumption of berries and mushrooms and who suspects that such risk guidance might be ‘a swindle’ (2002, 88). In part, such attitudes seem connected to the ubiquity of such risk and to individual powerlessness in the face of it: since 1995, food merchants in Kyiv (the closest major metropolis to the Chornobyl area) have no longer been required to display measurements of their products’ contamination levels, and though

Figure 5. A Ukrainian meme: the top text reads: “Rashisti [a widely-used informal term that combines *Rossiya*, Russia, with *fashist*, Fascist] fleeing Chernobyl.” The sign at left reads: “Rays of goodness [a commonly used expression of warm wishes, but here also suggesting the ‘rays’ of radiation] to you, darlings.” While the sign on the right is states: “They really glow with joy!” which is clearly playing on the common idea that radioactivity causes objects to glow). I am grateful to Liubov Vetoshkina for her assistance with parts of this translation.

some food manufacturers advertise their products as uncontaminated, there is no regulation of such claims (Phillips 2002, 30) and therefore no way to reliably monitor one’s exposure to radiation.

Not only are the risks ubiquitous, but they are also opaque in their calculation and impermeable to human senses. Radiation cannot be seen, heard, smelled, tasted, or felt; its odd timescales, insofar as it can kill in microseconds but can also endure for hundreds of thousands of years, cause it to be experienced as “uncanny” (Masco 2006). Radiation also produces both deterministic and stochastic effects: that is, while certain effects of radiation are predictable and proportional above a certain threshold, effects whose severity is not proportional to dose and whose occurrence is probabilistic rather than predictable also exist. As a consequence, the danger posed by radiation is always ‘uncertain,’ and scientific predictions can sometimes contradict the lived experience of those experiencing said danger (Petryna 2002, 17). Indeed, Ulrich Beck suggests that a key characteristic of this type of danger is that it “initially only exist[s] in terms of the (scientific or anti-scientific) knowledge about [it]” (1992, 23), that “even where it is in plain view, qualified expert judgment is still required to determine it ‘objectively’” (1992, 27), that indeed it can only become “visible or interpretable” as a danger through tech-

noscientific mediation (ibid). The impossibility of *knowing* danger therefore becomes a central part of the post-Chornobyl experience. Petryna describes how "[t]he apparent arbitrariness of the [health risk] situation prompted people to search for other resources and clues to render an uncertain and unknowable world knowable and inhabitable in some way" (2002, 63). Agents of risk—"invisible but omnipresent pollutants and toxins"—assume the role of "the spirits" in a "kind of new 'shadow kingdom,' comparable to the realm of the gods and demons in antiquity, which is hidden behind the visible world," and interacting with them involves "evasion rituals, incantations, intuition, suspicions, and certainties" (Beck 1992, 72–4).

Toxic Discourse

The less that the risks produced by Chornobyl are perceived to be controllable and the more that they are perceived to be ineradicable, incalculable, ubiquitous, and shared—the more, in other words, that the toxicity of Chornobyl becomes a normal or even "natural" part of life—the less Chornobyl itself (as accident and site) seems to participate in what Lawrence Buell describes as "toxic discourse." This is a genre that draws heavily upon the pastoral ideal and moral melodrama in order to mobilize communities towards social-environmental justice. Buell specifically mentions Chornobyl as one of many examples that thus function both as incidents and as figures in a postindustrial imaginary of "environmental apocalypticism" (1998, 642). Toxic discourse builds upon the rhetorically potent "illusion of the green oasis" (Buell 1998, 648) that is positioned as the natural state of the earth and the natural home of humanity, contrasting the promise of this oasis-home with the threat of "a world without refuge from toxic penetration" (ibid). The emotional-aesthetic content of both discourse and response (Buell refers to the "sheer eloquence—the affect—of testimony or ordinary citizens' anxiety" [665]) has a remarkable capacity to provoke judgment in the absence of evidence. As Buell somewhat ambivalently notes, this may, at times, be justified in situations where a "climate of scientific and legal complexity" (660) is incapable of meaningfully articulating or accounting for risk. Yet, at the same time, its "shrill apocalypticism" (662), reliance on affective production, and mythologization of the uncontaminated past are problematic in ways that the case of Chornobyl clarifies.

Take, for example, the recent theorization of Chornobyl by Gabriele Schwab. Schwab appears to be working from an inaccurate grasp of the

facts of the Chornobyl accident (amongst other problematic claims that populate her book);[2] she references, in what seems to be a misinterpretation of testimony collected by Svetlana Alexievich, abandoned Polesian villages "where native plants — burdock, stinging nettle, and goosefoot — were taking over the untended communal graves of radiation victims" (2020, 165). In Alexievich's book, the "communal graves" (2005, 120) appear to be a reference to old war graves that were previously tended by village residents, now evacuated, rather than the graves of radiation victims. The reference also resonates with a mention, in the previous testimony, that liquidators would bury abandoned "[d]resses, boots, chairs, harmonicas, sewing machines" in ditches and call the ditches "communal graves" (Alexievich 2005, 119). In Schwab's very different vision, villagers died from radiation poisoning in such numbers and at such a rate that their (mass?) graves were abandoned (2020, 165). In reality, the official death toll of the Chornobyl accident is thirty-one, of whom some died months after the accident (Petryna 2002, 2). The difficulty of reckoning with the scale of Chornobyl's suffering is not due to the scale of the disaster as mass fatality event, but rather due to the slow, distributed, and difficult-to-quantify effects of radiation on survivors. The fantasy of mass fatality, however, is consistent with Schwab's portrayal of the Chornobyl Exclusion Zone as a "deathworld," a "mutant transitional space of the living dead" (2020, 165–8). Schwab's use of a continual present tense that conflates testimony from 1986 with the current era collapses all events into one unchanging moment of destruction. In Schwab's view, Chernobyl is overshadowed by death and oscillating between "traumatic shock and a haunting from the future" (168). This is, indeed, a vision of "a world without refuge from toxic penetration" — and, not only that, but a world in which toxicity is synonymous with death.

But toxicity, even nuclear toxicity, is *not* synonymous with death — neither with Schwab's ahistorical deathworld (which she uses to pose the classic toxic-discourse question, "[h]ow many Chornobyls or Fukushimas does it take to convey that we depend on clean water, air, and soil for our survival?" (2020, 147) nor with the mirror image of this deathworld, the cleansing death-of-humanity that is also characteristic of Chornobyl narratives. In the latter case, exemplified by the 2011 PBS *Nature* documentary "Radioactive Wolves" and by Henry Shukman's travelogue of "Chernobyl, My Primeval, Teeming, Irradiated Eden" (for further examples see Ferebee 2022), human self-immolation makes way for a return to the "green oasis" that preceded human civilization and is the natural state of the world. Both of these extremes posit nuclear toxicity as something that is fundamentally apocalyptic insofar as it is unincorporable or un-re-incor-

2 For example, Schwab somewhat oddly suggests, citing a discredited and fringe work of popular history, that Robert Oppenheimer was a Soviet spy.

porable. In each case, nuclear toxicity's unincorporability quite literally ends time: locally collapsing the temporality of the Chornobyl Exclusion Zone in Schwab's account so that it becomes meaningless to order history, since history is over; or, in the Edenic account, completing a circuit so that mythic past becomes joined to mythic future. These Edenic accounts of Chornobyl almost without exception focus on the Exclusion Zone as an ancient wilderness that simultaneously stands in for a post-human future (Ferebee 2022). Though, in the Edenic account, the Exclusion Zone is Edenic precisely because it is too toxic a place for humans to safely live, this toxicity is made invisible through the image of an inexhaustible nature whose vitality is greater than the anti-vitality of the Anthropocene, here embodied by the radioactive. Humans cannot safely live in the Zone because they are not 'natural,' such narratives imply; whereas animals, because they *are* natural, can do so.[3] (Shukman [2011] portrays Chornobyl self-settlers as living a "rustic" and "timeless" life that, apparently, is enough to protect them). In both the deathworld and Edenic narratives of Chornobyl, the end of 'time' is not the end of 'things'; the world *is*, but the world does not 'continue.' Or rather: the world *is*, but the world is, in a sense, post-sense. Ted Toadvine links apocalyptic imaginings to the end of "the world *as we know it*, the total horizon of meaning, value, and possibility within which our lives unfold" (2018, 56); I would suggest that the apocalypse as end of the "meaningful" world/initiation of the "deathworld" (and as substitution of the world-as-nothing-but-itself for the world that is both virtuous and replete with virtualities) fundamentally signals an end of the making-of-sense. Or rather: a refusal to imagine the unfolding of a particular kind of sense.

Apocalypse vs. Apocalypse

Why is nuclear toxicity a site at which so many stage a refusal of sense? Without delving too deeply into the work of Derrida, I think that there is perhaps something in his notion that apocalyptic language itself participates in the apocalypse it proclaims (Derrida 1984, 35) and that the discourse of nuclear toxicity is in this sense a calling-forth of something that is very much desired; which is an escape from the necessity of imagining a world into which the nuclear toxic has been incorporated. In other words, it is a refusal to imagine the possibility that nuclear toxicity might profoundly change the world but not destroy it — the possibility that both the human and the nonhuman might outlast what they are imagined to be, their current "horizon of meaning, value, and possibility (Toadvine 2018, 56).

3 Shukman (2011) portrays Chernobyl self-settlers as living a "rustic" and "timeless" life that, apparently, is enough to protect them.

Derrida himself sketches the paradoxical shape of the "apocalypse *without* apocalypse" that results from a refusal of apocalypse, in which "the catastrophe would perhaps be *of* the apocalypse itself…a closure without end, an end without end" (1984, 35). What is apocalyptic is the fact that the apocalypse is not coming (or rather, perhaps, that the apocalypse can only ever be imagined in advance of itself, owing to the fact that any real "end" would necessarily postdate representation). There will be no posthuman Eden in which natural abundance erases the specter of radiation, and there will be no deathworld in which the specter of radiation erases everything else. Rather, the very persistence of this world denies us the ability to manufacture "meaning, value, and possibility" from it—or, more accurately, reveals that the means through which we did so were always tenuous and flawed.

When I refer to making "meaning," I am drawing on the way in which Jean-Luc Nancy discusses bodies as having (or, more pertinently, not having) a sense. Nancy argues that our world is increasingly exposed as "ecotechnical," and that the ecotechnical destabilizes both linear narrative logics and binaries of natural/artificial. "[F]or the projections of linear histories and final *ends*," he writes, the ecotechnical "substitutes the spacings of time, local differences, and numerous bifurcations" (2008, 89). It "deconstructs the system of ends, renders them unsystemizable, nonorganic, even stochastic" (ibid). Thus: "[t]he world of bodies has neither a transcendent nor an immanent sense" (ibid); importantly, it "owes its *technē* and its existence, or better, *its existence as technē*, to the absence of a foundation, that is, to 'creation'" (101). As Henk Oosterling (2005, 96) has noted, in my opinion correctly, what Nancy calls "world" (*monde*) in his work seems to be what Derrida discusses as *khōra*: the precedent to and mother of legible being, the unformed ferment that "has no meaning or essence" (Derrida 1995, 103) and is defined by its situation outside of the sensible or the intelligible (103–4). *Khōra* invites or even demands a making-sense-of, but it is not the sense that is made of it. It *precedes* the sense that is made of it. I say *precede* in a very specific sense that Derrida highlights, in which "[*b*]*efore* signals no temporal anteriority" (125) insofar as *khōra* is eternally prior to (one might say "outside of") "the meaning of a past" (ibid). All of this sounds very abstract, but in fact, as Derrida also points out (109) it is *not* abstract. *Khōra* refers very materially to a territory or region. The Ancient Greeks used the term in its non-philosophical sense to refer to the land or environment that exists in opposition to the *polis*, the mapped and ordered city, and the concept of *khōra* is used somewhat differently in rhetorical studies to discuss material, embodied practices (Ulmer 1994; O'Brien 2020). So it is not particularly odd to

suggest that *khōra* is the material world prior to sense or meaning, an ecotechnical world that is stochastic and neither sensible nor intelligible.

In outlining this vision of *khōra,* I wish to evoke a world without reference to 'nature,' a world in which there is no 'natural state of things' from which all else exists only as deviation. The 'natural state of things' is of course the Edenic to which toxic discourse hearkens back, the world-as-it-was-created. (Of course, we understand that this is not, in any historical-scientific sense, how the world was when it came into being. This helps us to understand that the Edenic does not acquire semantic force through any particular historical-scientific situation, but rather through its mythic-symbolic signification). Meaning is interpreted in part through the measurement of difference: thus, in toxic discourse, deviation from the "natural" (Edenic) is mobilized for both aesthetic and moral impact. This deviation is usually characterized in resolutely spatiotemporal terms; we are 'far' from the natural, or it is eternally receding into the 'past,' as Raymond Williams (1973) famously found when he attempted to trace back the "golden age" of the English pastoral.

In other words, the world of sense orientates itself around an Edenic axis. It is for this reason that the nuclear toxic is experienced as disorientating bodies (Masco 2006, 32–3). What Masco describes as a "theft of sensibility" (28), the inability of the senses to make sense of the signs in the environment around them, is, in fact, the realization that we cannot rely on a symbolic lexicon that understands signs according to their alignment with or deviation from an Edenic image. (Masco suggests that the "strange duality of the nuclear age" can be seen in the way that "contamination, and the possibility of mutation, can travel hand in hand with visible signs of health and prosperity" [2006, 33]. But in fact the visible becomes interpreted as "signs of health and prosperity" insofar as it, or they, align with a specific vision of the Edenic.) We experience this failure as a loss of the Edenic even though the Edenic has never been real; we mourn the Edenic as imagined-origin and as virtual possibility of the future, even though neither of these has ever been the case. Our disorientation is not, in fact, a disorientation *in* or *of the world,* but a disorientation of the imaginary: an apocalypse of our ability to make sense.

The persistence of the world in the face of this interpretive collapse (which, it is important to point out, is not a collapse of meaning caused by some extreme characteristic of the nuclear, but rather an exposure of the fact that our meaning-making practices have *always* been arbitrary and insufficient) is what creates the uncanniness that Bryukhovetska (2013) identifies at Chornobyl and that Masco identifies as a trait of the nuclear more broadly. The familiar (the material world) becomes unfa-

miliar through the failure of meaning-making practices. We see that what we had thought was immanent (meaning) is in fact unmoored. And the more we look for a mooring-point to which to tie our meaning-making practices, the more we are confronted with the arbitrariness and insufficiency of those practices. If the Chornobyl Exclusion Zone is neither Eden nor apocalypse, then what is it? And on what basis (lacking 'the natural state of things' as interpretive mooring-point) can we make any argument about what it is?

Current representations of Chornobyl-as-place suggest that, in a Ukrainian context, one way to look at it is: a dwelling-place, or, in other words, a home. This is the impression that one receives from interviews not only with Graldina but also with other Chornobyl tour guides who used their equipment to track the invasion of the Exclusion Zone and shared fabricated local 'knowledge' about radioactive risk to discourage Russian soldiers (Arhirova 2022; Berger 2022). It is also the impression that is given by Kamysh's account of the anthropomorphized Chornobyl whom he loves and whom he has "lost — for now." And it is the impression given by memes that represent a specifically toxic Chornobyl as embodying Ukrainian resistance to Russian invasion. It is even the impression given by some news coverage that centers around the risk of "another Chernobyl": a *Reuters* report (Vyshnevska 2022) centers on a Ukrainian couple who had worked as engineers at the Chornobyl NPP, had been evacuated from their home in 1986, and were now refusing to leave their new home near Chernihiv. "God forbid we should have to be evacuated again," they tell Reuters; figuring their central fear as one of displacement rather than of possible nuclear toxicity. In contrast to the Chornobyl survivors interviewed by the *New York Times,* who view radiation as the source of their exile and alienation, the *Reuters* subjects seem to blame the war and its Russian aggressors. One is reminded of Graldina's claim: "it wasn't radiation that stopped everything for me, it was Putin" (Pendlebury 2022). The couple acknowledge that in the case of a Russian attack on the Chornobyl NPP, "radiation would spread all over Europe," but this oddly frames the nuclear risk as one that is primarily posed to the rest of Europe rather than to Ukraine itself, whose primary concerns are different.

Contamination Thinking

The introduction of the threat of radiation "spread[ing] all over Europe" opens a new dimension to the question of why Chornobyl functions as a particularly potent rallying-point. Large parts of the Chornobyl discourse

in the current war are circulating in non-Ukrainian communities for whom Chornobyl is neither a national trauma nor an affectively-powerful piece of 'home.' Given this, why does Chornobyl so effectively mobilize the attention and emotions of the transnational community? It is a question whose answer is less obvious than it may initially appear: after all, large areas in the industrialized world are already toxic and/or even radioactive;[4] as Kate Brown (2019) points out, the transnational community may even already eat produce from the contaminated Polesian area around Chornobyl, as the Polesian berry-picking industry routinely 'cheats' radiation monitors by mixing contaminated and uncontaminated berries to achieve an acceptable average emissions measurement for export (Brown 2019, 363–4). Though intense anxiety in Western Europe and the U.S. surrounded the 1986 Chornobyl accident and its possible biological effects, most of this has proved to be unfounded (for a detailed discussion of the complex dynamics involved in assessing the 'real' effects of the accident, see Kalmbach). It is therefore unlikely that the landscapes of the West, even if they were not already toxic, would be significantly affected by a 'new Chernobyl' in Ukraine. Ukraine itself *would* be affected, but this too is a more complicated statement than it appears. Brown argues that "Chernobyl is not an accident but rather an acceleration of a timeline of exposures that sped up in the second half of the twentieth century" (2019, 362). It's therefore inaccurate to think of any "Chernobyl" as a single event with an effect, separate from the context of institutional violence and global pollution that surrounds it. At the same time, Ukraine is *already* being affected, more seriously, by the Russian invasion: loss of life, mass displacements, social and economic disruption, and the long-term mental, physical, and environmental effects of this crisis. Yet the threat of Chornobyl clearly exercises a separate and unique power, as its prominence in transnational news media shows.

This affective power suggests that 'Chernobyl' as signifier operates as a container for cultural anxieties that are only somewhat related to Chornobyl itself. These anxieties tend to center around themes of contamination. Jaimey Fisher, for example, reads Chornobyl in German cinema as a site where post-Cold War fears about permeable and shifting national identities are worked out; the inability of Chornobyl-as-disaster to be contained by national borders stands in for larger discomfort with the "porous borders of the nation… here made parallel to the porous borders of the psyche" (2011, 20). Fears of a "new Chernobyl" reflect similar anxieties insofar as they involve a perception that suffering elsewhere cannot be contained and will reach across borders to 'contaminate' the here-and-now. Indeed, Volodymyr Zelenskiy (2022a) specifically evoked such anxieties in a

4 Both Kate Brown (2013) and Joseph Masco (2006; 2021) discuss the underpublicized nuclear toxicity of American regions, while Brown also explores the contamination caused by Soviet nuclear disasters. Non-nuclear toxic contamination is well-attested, but particularly striking is the discovery of microplastic contamination in human blood (Carrington 2022), human amniotic fluid (Carrington 2020), and the remote Mariana trench (Carrington 2018) as well as the discovery that toxic 'forever chemicals' are present in rainwater almost everywhere on Earth (McGrath 2022).

4 March 2022 speech that saw him remind Russians that "[r]adiation does not know where the border of Russia is." In an 11 August 2022 speech to the Council of Defence Ministers of Northern European Countries, Zelenskiy (2022c) began by describing the moment in 1986 when a Swedish nuclear power plant detected contamination borne from Ukraine on the wind, again drawing attention to the failure of boundaries in the face of radioactive crisis.

At the root of these interlinked fears of national, ecological, and bodily transgression seems to be a fear that what was once pure and whole has become contaminated or broken; that, having demonstrated itself to be porous/permeable, it might at any moment reveal itself as something 'unnatural' and incomprehensible to us. This is the same soil that toxic discourse grows in. Fundamentally, we fear that 'our' world will be revealed as not 'the' world (any alteration to which can only be perceived as impurity or loss), but rather as one of innumerable possible worlds generated by the fermenting nonbeing of *khōra*. This is the apocalypse without apocalypse. And this is, of course, precisely the disaster that Chornobyl figures or is figured as, a figuration that is evident in Zelenskiy's description, in his 4 March 2022 speech, of the Russian attack on Zaporizhzhia as "the night that could have stopped the history of Ukraine and Europe" (2022a). It figures thus perhaps most powerfully in the moment at which one can envision a 'second Chernobyl,' since to do so posits the survival of a world beyond the first. In fact, to talk about 'second Chernobyl' is inherently problematic insofar as "the first Chernobyl" has not really ended. Its biological effects continue to propagate. Therefore, to talk of a 'second Chernobyl' is to implicitly foreground the troubling fact that the first Chornobyl did not *end* the world, and yet the world has also not *survived* it, or at least has not survived it intact. This phrase pushes on this point of contradiction and raises the haunting possibility that our world is contaminated already. At the same time, however, it engages in another paradox or contradiction: in highlighting the 'second Chernobyl' as a disaster that is categorically different from other disasters (a disaster that is uniquely far-reaching in its temporal and spatial impact, a disaster that is uniquely contaminating in its ability to penetrate the body, the nation, and the environment), it attempts to demarcate a world that is 'still pure.' If a 'second Chernobyl' poses a threat, then this must be because we have survived (and therefore contained) not only the first Chornobyl, but also the multitude of other 'contaminating' agents that threaten to tear apart our world at the seams. The rhetoric of the 'second Chernobyl' thus doesn't so much *threaten* the apocalypse beyond apocalypse as it does *repress*

the realization that this apocalypse has already (and even always already) occurred.

I am reminded here of the way in which Lennard Davis mobilizes Lacan in the context of disability theory. "For Lacan," Davis writes, "the most primitive, the earliest experience of the body is actually of the fragmented body" (1995, 138). Only gradually does the infant unify these fragments through the "hallucination of a whole body" (139), leading to the child's ability to "misrecognize" the singular and whole object it sees in the mirror as itself. The disabled body, Davis argues, causes cognitive dissonance because the subject looks at the disabled body and recognizes its own fragmented body, which it has repressed. The idea of the whole body is always only a hallucination and always on the verge of falling apart; "the 'real' body," Davis writes, "the 'normal body,' the observer's body, is in fact always already a fragmented body" (140). To say this is not to suggest that a disabled body might not experience suffering; it is to suggest that there is no such thing as a categorically "disabled" body, because there is no such thing as a categorically "whole" body. All bodies are fragmented, and all bodies have the potential to experience suffering. If we insist upon making sense of our bodies by mapping them as deviance from an imaginary whole, we don't actually attend to suffering. We turn away from our bodies, creating an exculpating account of loss and incompleteness that is eternally orientated towards the never-was and has-not-yet-been.

In many ways, this turn benefits those who stand at a distance from crisis. There is little that the Global West can do to prevent "another Chernobyl"; at least, little that does not involve more direct involvement in the Ukraine war, which is perhaps why the Ukrainian government deploys this rhetoric so frequently. Anxiety about this 'second Chernobyl' therefore asks little of the world in terms of immediate, practical anti-fascist action. It does not demand aid for Ukrainian refugees. It diverts attention from the ways in which the transnational and highly complex nature of global capitalism leaves corporations and governments enmeshed in financial support for Russia. Fundamentally, it hearkens to the way that Sara Ahmed (2014, 20–22; 2010, 34–37) suggests that certain objects (including certain words and certain stories) work to produce emotional transformations that allow the subject to feel certain ways. Often, these transformations also obscure certain agencies or responsibilities that are at work in the object. Here, fear of contamination (and the Anthropocene anxiety that underlies it) obscures more probing questions about what kinds of suffering are happening and how these kinds of suffering are being produced.

How can we learn to engage with Chornobyl as a lived experience and material site rather than engaging with 'Chernobyl' as affective signifier?

Recent efforts have not been particularly successful. Though I agree with Courtney Doucette's assessment of the 2019 HBO miniseries *Chernobyl* as a failure insofar as it fabricates an ideological explanation of the Chornobyl disaster, I strongly disagree with Doucette's position that the history of Chornobyl points us towards a need to be skeptical of nuclear power (846). Fundamentally, Doucette seems to commit the act that she criticizes in others: Doucette argues that Chornobyl ought to function as a lens through which to assess the global present (849), yet what makes HBO's *Chernobyl* so troubling is that it bends history in its commitment to utilizing Chornobyl as, primarily, a way of talking about current events. Indeed, the miniseries has been prominently read as a text that is "about" climate change (PRI; Kahn). This search for transhistorical, universal meaning refuses to ask what Chornobyl is *as Chornobyl:* what it continues to be for those enfolded within its expanding assemblage. Maybe we need to stop forecasting a 'new Chernobyl' and grapple with the ongoing Chornobyl that we've got.

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Mediation and Autobiographical Ghosts

Abstract: In the summer of 2022, New York City Emergency Management released a PSA advising New Yorkers how to prepare in the case of a nuclear attack. Though provoked by the war in Ukraine, the many bewildered and shocked responses to the PSA revealed that a 'return' to fears of nuclear war was unimaginable for most New Yorkers, not to say most Americans. At the same time, reporting on this PSA from countless news outlets contained a curious detail: journalists were identified not merely by reporting agency, but through short bios filled with personal details about hobbies, family, and pets, among other things. This paper begins with the contrast between 'unimaginable' nuclear disaster and the need to foreground personal details in otherwise impersonal discourse. This contradiction between the unimaginable and impersonal confronts a demand to make things 'relatable' and intimate. Drawing on my previous arguments about 'negative hauntology,' or a collapse of temporality that leads one to imagine that a future disaster has already happened, that one is always-already a victim of disaster, that one haunts one's own present as a ghost, this paper frames how many relations today seem ghostly, a fact which emerges from the contradiction between the impersonal and personal. Drawing out how spectral apparitions have long been linked with the capacities and limitations of mediation, this paper argues that the specificity of 'nuclear ghosts' emerges at the intersection of mediating otherwise imperceptible, yet present dangers, and mediating perceptible, but distant others who are framed through banal, yet intimate traces.

Keywords: ghost, hauntology, Jean-Luc Nancy, time, nuclear disaster, apocalypse

In the summer of 2022, New York City Emergency Management released a PSA advising New Yorkers of how to prepare for a nuclear attack. Though provoked by Russia's attack on Ukraine, the many bewildered responses to this PSA revealed that a 'return' to fears of nuclear war was unimaginable for most New Yorkers, not to say most Americans. The video itself, presented in a disturbing but vague future-past tense, begins with a woman dressed in all black, poorly composited onto a city street. "So, there's been a nuclear attack," she says in a straightforward manner. "Don't ask me how or why, just know that the big one has hit." (NYC Emergency Management, 2022) The video gives ambiguous tips on what to do next: get inside, stay inside, and stay tuned. It concludes with the woman, now placed into a generic loft apartment space (one presumably located within New York, although it looks more like an Ikea advertisement), ending her instructions upliftingly: "You've got this!" One is left with a lack of specificity and an uncanny sense that the video — and perhaps the intended viewer, as well — exists outside of time and space.

Reporting on this PSA, from countless news outlets, contained a curious detail: journalists were identified not merely by reporting agency, but through short bios filled with, among other things, personal details of hobbies, family, and pets. For example, Bruce Y. Lee tells us in his byline for *Forbes* that he is a "writer, journalist, professor, systems modeler, computational and digital health expert, avocado-eater, and entrepreneur, not always in that order" (Lee 2022). NPR's reporting on this PSA was by Wynne Davis. Davis, along with providing a quote from Mayor Eric Adams explaining the video was intended for "taking necessary steps after what happened in Ukraine," lets us know that she loves the St. Louis Cardinals Baseball team, a personal detail accompanied with a devil's horn hand emoji (Davis 2022). Brian Pietsch, at the *Washington Post*, relays simultaneously that "the world's nuclear arsenal is set to grow over the next decade for the first time since the Cold War," and that he loves rock climbing, skiing, and biking (Pietsch 2022). Over at *Bloomberg*, we learn that only 12% of New Yorkers feel prepared for "a radiological incident," and that the author Isabella Steger has a cat and "gatekeeps 90s culture" (Steger 2022). *Vice*'s Matthew Gault also has a cat. From his article we learn that: "If Russia's SS-25 missile (it's [sic] largest known nuclear warhead) detonated over Midtown Manhattan, everything from W. 30th to W. 52nd street [sic] and between 10th and 3rd Avenue would be gone. Vaporized" (Gault 2022). We know that the *New York Times* reporting on the subject is by two people (Emma G. Fitzsimmons and Jeffery C. Mays) who, respectively, are a "subway enthusiast and mom of two boys" and follow the same arts critics as I do on Twitter (Fitzsimmons and Mays 2022).

I want to use these examples, of journalists simultaneously providing information about impending nuclear doom and personal (but not *too* personal) life details, as a way into the primary claim of this article: all these journalists are ghosts. And not just these journalists, but *everyone* today. Due to various catastrophic changes to time and space (or, more accurately, the perception and experience of time and space) we are living in a permanent 'after,' which, in terms of how the subject imagines itself, places humanity within an enduring 'afterlife' in relation to both personal and collective memory, the valuing of life, and the ability to act collectively. Rather than historical subjects acting and intervening in the present, we understand ourselves as spirits haunting our own present, largely unable to intervene beyond any typical ghostly actions: moaning, crying, warning, becoming visible for short times in specific, rare, and difficult manners. This is, I suggest, a particular outcome of nuclear disaster in a context shaped by current economic and technological demands.

This might seem like a giant leap—moving from personalized bylines to claiming that we are all ghosts—but bear with me. News coverage of the potential of nuclear disaster, like almost all news we receive now, is deanonymized. It is not the news, but information from a person we know intimate details of. Writers are leaving personal traces along with the impersonal reportage of daily events. Bylines are rattling chains and social media is a haunted house. Ghosts leave traces; pieces of themselves. You smell their perfume; you leave them their favorite foods on alters. You need to know that they sometimes ate avocadoes, above all else. Personal details, I suggest, are not only evidence of the necessity of branding oneself in an age of freelancing and social media spectacle, but involve a temporality in which one's projection into the future—as having a significance in daily life that will endure—is simultaneously a retrojection into the present that requires the subject to imagine itself as always-already deceased.

This is a similar argument to the one offered by Gabriele Schwab, who, in her book *Radioactive Ghosts,* suggests that we live within a "nuclear episteme," which is, for her, characterized by two intertwining themes: a denial of the thorough imbrication of daily life with the threat of the nuclear while being traumatized and shaped by that threat. "Many do not want to think or even know about the full extent of the nuclear threat," (2020, 5) Schwab argues. "And we would indeed not be able to live our daily lives, let alone enjoy them, if we did not succumb to a fair amount of psychic splitting. This means that we go on living as if the nuclear danger were not there" (2020, 5). At the same time, Schwab argues, as I also will in these pages, "[n]uclear subjects are traumatized subjects, haunted

by memories of nuclear catastrophes while also harboring the invisible ghosts of a future nuclear disaster in a sealed-off crypt within the core of their selves" (xiii).

The difference in my argument and Schwab's comes from the intersection of these two ideas. For Schwab, it is the denial of the nuclear threat that enables a "haunting from the future," in which the refusal to acknowledge past catastrophe enables an out-of-joint temporality where the threat — be it in terms of genetic mutation, illness, or mass death — is always to come, perpetually deferred through an inability to reckon with the realities of nuclear energy. My view is, instead, that the past traumas of the nuclear *are* acknowledged, if at an unconscious level; revealed through the seeming necessity of making one's mark on existence. One reason it has become so important to ground factual accounts through personal information is not because the catastrophe is yet to come, haunting us from the future. It is because we imagine ourselves as already deceased, as already gone. We have faced the threats, died, and are continuing.

Although I will theorize catastrophe, disaster, and accidents in more detail later, and will also distinguish (and conflate) nuclear disaster and accidents from purposeful acts of nuclear war, it is important to reiterate why we experience nuclear catastrophe differently than, say, climate change catastrophe or the exploding of the sun. The nuclear is distinct from countless other imaginations of trauma and crises today, which, while threatening us existentially, have not yet occurred. For instance, as Ray Brassier theorizes in his book *Nihil Unbound:*, the sun is a catastrophe that leads us to already being dead in the same way I argue that we are ghosts. He writes:

> The extinction of the sun is a catastrophe, a mis-turning or over-turning (*kata-strophe*), because it blots out the terrestrial horizon of future possibility relative to which human existence, and hence philosophical questioning, have hitherto oriented themselves. Or as Lyotard himself puts it: '[E]very-thing's dead already if this infinite reserve from which you now draw energy to defer answers, if in short thought as quest, dies out with the sun' (Lyotard 1991: 9). *Everything is dead already*. Solar death is catastrophic because it vitiates ontological temporality as configured in terms of philosophical questioning's constitutive horizonal relationship to the future (2007, 223).

The catastrophe of the sun is able destroy one's relationship to the future, and when this is destroyed, we are already dead.

However, I point to nuclear power as the ultimate catastrophe because it is not yet-to-come in the way the sun's destruction is. Nuclear disaster has already happened and can happen again. This concept of time is less messianic and more akin to evangelical-nihilism (and Adam Kotsko writes in his article *The Evangelical Mind* that nihilism is intrinsic to Evangelism today (2019)). To be fair, Brassier tells us that the sun *has* already exploded:

> But far from lying in wait for us in the far distant future, on the other side of the terrestrial horizon, the solar catastrophe needs to be grasped as something that *has already happened*; as the aboriginal trauma driving the history of terrestrial life as an elaborately circuitous detour from stellar death. Terrestrial history occurs between the simultaneous strophes of a death which is at once *earlier* than the birth of the first unicellular organism, and *later* than the extinction of the last multicellular animal (2007, 223).

Has the sun exploded? At an existential, ontological level, sure; but at an experiential, actionable level, no. We might be able to philosophize what Brassier is discussing, but a timeline of millions or billions of years is so beyond the human scale that we cannot comprehend it phenomenally.

Nuclear catastrophe, however, has happened in an experiential, documentable, lived way. We have photos in textbooks and museums, memorials across the world to its victims, and laws and global organizations dedicated to preventing further destruction. Nuclear apocalypse has happened and is yet to come. For the purposes of this essay, I should note that I am talking about a particular form of western individualism which lends itself perfectly to fearing and denying death while refusing to look to others, collectively, for a way forward. I've previously discussed how emerging digital infrastructures provide an opportunity for new forms of animism (with the animistic often positioned as closer to nature, as removed from the ethical problems of western individualism, and so on) and how these opportunities sometimes cause divisions between western and non-western conceptions of death and immortality (Bollmer and Guinness, 2018). I might frame what I describe here as a result of a western sense of linear time, rather than a form of temporality which would apprehend the nuclear and apocalypse differently. Motoko Tanaka discusses this difference of perceptions of time in *Apocalypse in Contemporary Japanese Science Fiction,* writing, "[w]e are apt to think, due to the spread of Christianity, that the cyclical understanding of time has faded. The linear model is taken for granted in our age [...] the understanding of history via the application of the cyclical view of time to historical events

continued to prevail in the world until very recently, and this view is still prevalent in some cultures, including the agricultural societies of contemporary Europe" (2014, 17).

In my account, the future has already passed into the present, becoming something that speaks not of a deferral into the future, but of a splitting that does not deny the past, properly speaking, but approaches one's life as already concluded. In this version of the "nuclear episteme," the inability to do anything—about politics, catastrophe, and social collapse—is a result of the fact that one imagines their agency as the agency of a ghost, only able to haunt through details that express one's presence, but unable to do much, if anything, to impact or change events previously set in motion.

1.

Since the PSA's summer release, fears of a nuclear attack have only grown stronger. For example, in October of 2022 President Joe Biden claimed, "[w]e have not faced the prospect of Armageddon since Kennedy and the Cuban Crisis" (Richards and Smith 2022). "Joe Biden Believes U.S. is Closer than Ever to Nuclear War," cried one headline (Bush 2018). Yet, this headline was not in response to the 2022 announcement. It was from January of 2018. In fact, the nuclear preparedness video was commissioned and produced in 2018, as well. This was pointed out by a *New York Times* article which delved into the various governmental funds that paid for the video's production (Fitzsimmons and Mays 2022). In other words, the legitimation for the PSA with which we began—the potential of nuclear war after Russia's invasion of Ukraine—is a legitimation placed onto the video after the fact. The closeness to nuclear war felt in 2022 was a repetition of similar feelings from 2018.

This repetition does not speak to an ever-deepening closeness to nuclear war. We've always been close to Armageddon and apocalypse. We just forget, as Schwab suggests, about the deceit and denialism of the history (and reality) of the nuclear. Yet, I believe we've flown past the apocalypse, the threat of ultimate catastrophe, to a holding pattern within the 'after.' In the afterlife time acts differently, our memories fail us, and we cannot value human life because we are already dead. This happens again and again, and I agree with Jean-Luc Nancy when he suggests that this change in temporality is a result of nuclear technology—both nuclear weapons and nuclear energy (and, more specifically, the disasters produced by both). Nancy, in his book *After Fukushima,* writes that the

"after" of his title "stems [...] not from succession but from rupture, and less from anticipation than from suspense, even stupor. It is an 'after' that means: Is there an after? Is there anything that follows? Are we still headed somewhere? *Where is our future?*" (2014, 15–16). This rupture of time is because, Nancy argues, "Our time—as it has been able to see itself at least since the First World War—is the era that knows it is capable of an 'end of days' that would be a deed created by humans" (19). While examples of history repeating abound, along with humankind's perpetual inability to learn from the past, for Nancy, the nuclear seems to draw all other catastrophes to it in a way that stops time.

This fungibility of catastrophes, the subsequent confusion and halting of time and temporality, is not an abstraction. For example, as I conceived of this article, my mother, who lives in Missouri, told me I should be sure to bring up the huge cache of nuclear weapons buried near my childhood home. (And yes, I realize that inserting my mother into this essay is a personalization no different than Lee's love of avocadoes. What can I say? This is where my spectral form takes shape for a moment. I am also a ghost. My argument is that we all are.) Like most residents of the area, she knows about this history. However, as I write this article months later, towards the end of 2022, I watch the *Today Show* shake its mediated, metaphorical head in horror and shock as Hoda Kotb reports on "significant radioactive contamination" at a school in suburban St. Louis. During World War II, weapons were produced in the area, the waste dumped at sites next to several major waterways (Today Show, 2022). The Boston Chemical Data Corporation has been studying this site for over twenty years and has long suspected it of causing many health crises and cancer clusters. And yet, we are surprised to hear about the contamination and the harm it is doing. Of course, the reporting on this simultaneously new and old nuclear accident in Missouri is spoken over flashing headlines of police murder and school shootings, other examples of ever (and increasingly) occurring catastrophe and horror that we do not seem to know how or desire to stop. These all demonstrate how little human life is valued in the face of late capitalism, as do countless other examples. Despite the constant attention to 'new' disasters, nothing seems to change, nothing seems to be done, political will seems incapable of change. The denialism of the past of the nuclear is not a true denial—it is acknowledged, sometimes directly in local knowledges about where to live and where to avoid. Sometimes it appears, an unconscious that is revealed as "new" despite the actual awareness of the history of the nuclear. This lived history and denial is, again, what differentiates the nuclear from entirely yet-to-come disasters (the sun exploding, for example).

Nancy also points out that the disaster which has allowed all disasters to now be conflated is nuclear disaster. Another difference may be that the nuclear contains so much harm that is entirely invisible, imperceptible, which is perhaps one of the reasons that its history is so easily ignored. Radiation is unseen; we know it spreads further and with more destruction than is ever officially stated. There is a quantifiable amount that is said to cause illness, but we're never quite sure what a safe level is. The effects of nuclear bombs themselves are also distant to us today (at least in the United States, as the nation that dropped the majority of these bombs). Howard Zinn writes that: "The public does not understand, I mean really understand what bombs do to people. That failure of imagination, I believe, is critical to explaining why we still have wars" (2007, 9). Radiation, buried weapons, the reoccurring promise of nuclear winter and Armageddon, these are difficult for us to grasp, in part because the nuclear exists on a different time scale than humanity. It occupies the space of what Timothy Morton (2013) refers to as "hyperobjects" or items that outlast humanity on such a level that we cannot comprehend them phenomenally. Morton's key examples include an object like Styrofoam, which — at a human level — is apprehended as disposable and temporary, only present in consciousness for a few minutes, a few hours, before being thrown away and hauled off to a landfill. Morton's point, however, is that any "disposable" Styrofoam object will endure in shaping the planet for far longer than any human life. The nuclear may very well be the ultimate hyperobject, as it cannot be grasped or even seen in the same way that say, Styrofoam can be. At least not without systems of mediation to aestheticize the nuclear and make it sensible, like a Geiger counter.

How different is a Geiger counter than any ghost-hunting technology? The EMF (electromagnetic field) detectors, digital recorders used to capture EVP (electronic voice phenomenon) seen in countless shows about ghost hunters are simply a system of mediation intended to access that which is beyond human sensibility. At the same time, the discursive formation of our world today is forcing us to hyper-personalize ourselves and identities as to be 'relatable' which is an essential part of the political economy of social media. These details and traces are today's ectoplasm, the "white, viscous substance, with an ozone-like smell" that would emanate directly from a medium's body as evidence of spiritual contact with the deceased, in which "the flesh itself … could be replicated over distance" (Peters 1999, 98). Not only distance, but from the realm of the afterlife. These traces are the cold air we feel, bristling the hair on our necks as we learn about how we might die in a nuclear bombing, and are haunted by details of others we will never contact without mediation. The journalists

above are ghosts because they live out of time and leave digital traces that keep them out of time. But so do we all. Why do we tell on ourselves in this way? We cannot be approached without systems of mediation; we imagine ourselves as ghosts because we imagine ourselves as dead day in and day out. Social media is one way of seeing ourselves and being seen, a Geiger counter, a cycling radio, a speck of dust in a photograph that could be something more.

2.

When all catastrophes are interconnected,[1] as Nancy claims, problems begin to look too big, minutia piles up, a cycle of neoliberal guilt, release, and forgetting kicks in. Because the problems confronting the world are so large — existential in nature, they threaten the future existence not only of humanity but of the planet as such — a common reaction is that it is impossible for individuals to do anything, a reaction intensified when democracy seems to lead nowhere, when institutions and authorities seem far more willing to accelerate the oncoming doom than ensure a future. And yet, individuals are still told to do their part, as if "solutions" come from autonomous, isolated monads working to ensure their future alone. As Donna Haraway explains throughout her book *Staying with the Trouble,* individuality cannot be maintained in light of the Capitalocene and Anthropocene. As we know, and as Haraway explains, we live in troubled and troubling times filled with "vastly unjust patterns of pain and joy" (2016, 1). Our task is to simply become capable within these times. How? To recognize that neither God-like technology will save us, nor will the problems go away if we just ignore them. Our relationship with time must change, we should stop holding out for a future-perfect. Or stop holding out for any future at all. Haraway continues, "[i]n urgent times, many of us are tempted to address trouble in terms of making an imagined future safe, of stopping something from happening that looms in the future" (1). We can't hide in the past or run to the future, we have to be here now, and most of all we must "stay with the trouble" no matter how uncomfortable it may be. We must also "make kin" with all kinds of non-human "critters." Haraway explains that, "[t]he task is to make kin in lines of inventive connection as a practice of learning to live and die well with each other in a thick present" (1).

Thinking about collectivity and time, how we as humans are thinking about what a body is and can be post-bomb, is integral to my theory that, today, we are all ghosts. While Haraway is discussing climate disaster of all

1 "Nuclear catastrophe—all differences military or civilian kept in mind—remains the one potentially irremediable catastrophe, whose effects spread through generations, through the layers of the earth; these effects have an impact on all living things and on the large-scale organization of energy production, hence on consumption as well. The 'equivalence' of catastrophes here means to assert that the spread or proliferation of repercussions from every kind of disaster hereafter will bear the mark of that paradigm represented by nuclear risk. From now on there is an interconnection, an intertwining, even a symbiosis of technologies, exchanges, movements, which makes it so that a flood—for instance—wherever it may occur, must necessarily involve relationships with any number of technical, social, economic, political intricacies that keep us from regarding is as simply a misadventure or a misfortune whose consequences can be more or less easily circumscribed [.] [...] The complexity here is singularly characterized by the fact that natural catastrophes are no longer separable from their technological, economic, and political implications or repercussions" Jean Luc Nancy (2014, 3–4).

sorts, not nuclear threats specifically, the threat of nuclear disaster opens new ways of understanding and making do with our bodies in time and space. Elsewhere, I have argued that nuclear disaster is an unusually apt subject for the medium of virtual reality, one in which VR works about nuclear energy, radiation, and disaster reveal a particularly strange relation of time and presence (Guinness 2020). I've framed this as a "negative hauntology," building on how this term, "hauntology" has been discussed by Jacques Derrida and some of those drawing on his work, such as Mark Fisher. In *Specters of Marx,* Derrida argues that "haunting," which translates as the French *hantise,* "is historical, to be sure, but it is not *dated*, it is never docilely given a date in the chain of presents, day after day, according to the instituted order of a calendar. Untimely, it does not come to, it does not happen to, it does not befall, one day, Europe, as if the latter, at a certain moment of its history, had begun to suffer from a certain evil, to let itself be inhabited in its inside, that is, haunted by a foreign guest" (2006, 3). Derrida's "hauntology" contends that "presence" assumes a temporality of having already been but simultaneously yet to come, the spirit that animates is both a ghost of the past and an arrivant from the future. An ethical and political injunction emerges:

> It is necessary to speak of the ghost, indeed to the ghost and with it, from the moment that no ethics, no politics, whether revolutionary or not, seems possible and thinkable and just that does not recognize in its principle the respect for those others who are no longer or for those others who are not yet there, presently living, whether they are already dead or not yet born. No justice—let us not say no law and once again we are not speaking here of laws—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, be they victims of wars, political or other kinds of violence, nationalist, racist, colonialist, sexist, or other kinds of exterminations, victims of the oppressions of capitalist imperialism or any of the forms of totalitarianism. Without this non-contemporaneity with itself of the living present, without that which secretly unhinges it, 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?' (2006, xviii)

Derrida's hauntology is a displacement that calls one to think beyond oneself. In some ways, it provides a temporality like the one Schwab argues to

characterize the "nuclear episteme." One is haunted by a past that is yet to happen, which depends on a sense of futurity that extends both into the future and past, a presence that is always gone and yet is inevitably realized in the future (2006, 201–202). This is messianic time, and as I mentioned earlier, the closest ideation to the sense of time I discuss could be called evangelical-nihilism.

My 'negative' in 'negative hauntology' is not meant to directly invoke the links many have made between Derrida's work and negative or Apophatic theology (i.e. Caputo 1989), a line of thought where one can only approach the divine through negation, though it shares some similarities with this aspect of Derrida's work. Negative hauntology is the inversion of the hauntological. It suggests not that presence is forever deferred into both past and future, resulting in the out-of-joint temporality of the present, but that the *ultimate disaster* — annihilation and the end of 'presence' — has already happened and is yet to come. Negative hauntology forecloses the ethical injunction of the hauntological; a responsibility towards both those who have died and those who are yet to be born, instead placing one's own subjectivity in the position of both past and future, while agency in the present is itself framed as impossible. Nuclear disaster puts us in a temporality in which we are always after, but also possess no future. It's not being stuck in the present but being stuck in the before and the after.

We are living in a moment where immortality and human perfection are promised through technology, in which, to reference a title of one of futurist Ray Kurzweil's books, one need only live long enough to live forever, making it to the "singularity," transcending biology, space, and time through the possibilities of technology (Kurzweil 2006). Yet, newspapers are filled with headlines telling us, "We Have 12 Years to Limit Climate Change Catastrophe" (Watts 2018), "Earth Will Survive. We May Not" (Frank 2018), and "We're Doomed" (Barkham 2018). Many are questioning the ethics of having children on a dying planet, while "longtermism," a philosophical and philanthropic movement that prioritizes thinking far, far into the future rather than addressing the problems and politics of the present, is increasingly popular among billionaire philanthropists. The modes of thinking today oscillate between the rapidly approaching inevitability of human extinction and of a temporality that stretches far, far into the future, filled with billionaires who have made themselves immortal. We are facing not just the ability to destroy ourselves in an abstract unknown (the nuclear bomb was always far away for those dropping them, a particularly American desensitization), but the reality of hav-

ing already done the damage that will and has come for us, so that our future ancestors will never come to be due to our (in)action.

Nancy writes that the catastrophes caused by climate change are all interconnected and cannot be unbraided, nor can these concerns be unbraided from any other, be they nuclear, be they accidental or purposeful. So then, how is it we can live in this simultaneity? Derrida warned that we must create an ethics "to learn to live with ghosts," and like Haraway's "making kin" with "critters" it is not an ethics of otherness but of living with others. Derrida continues, "[b]ut *with them*. No *being-with* the other, no *socius* without this *with* that makes *being-with* in general more enigmatic than ever for us. And this being-with specters would also be, not only but also, a *politics* of memory, of inheritance, and of generations" (2006, xvii). This suggests the problem is, at least partially, an inability to acknowledge the past. I wonder then, if he was preparing us to learn to live with ourselves, when we position our own existence and our own agency as past. Preparing us to be alone while interacting with thousands of other lonely individuals online, to write about the aftermath of a mass extinction which might have already arrived, while leaving individual traces of ourselves in case it truly has. I want to think that Derrida was telling us that we must learn to live with one another and ourselves as we would live with the dead, because it's what we are.

What I am suggesting is that the drive to make marks of personal details, details which seem related to the desire to be seen, acknowledged, and reassured that one's life will have amounted to something in the face of a range of interconnected, annihilating disasters, means that our debt is not to those who have already died and those who are yet to be born. Rather, we imagine ourselves as already dead and the future as filled with nothingness, so there will be no one living born to be in debt towards. These lived practices address a simultaneous desire: "I must be more than myself," and also, "the world is ending, who am I even speaking to?" And more than a result of the internet, its displacement of temporal duration in the name of instantaneity, I suggest that this temporality is a result of time after nuclear disaster, but not time after nuclear war.

3.

Progress is oriented towards the future. It is not just the bomb that led to the collapse of temporality, as 'progress' and 'war' can be recouped through national narratives that legitimate exceptional violence. It is the capacity of the nuclear not as an agent of war, but as an agent of 'acciden-

tal' death and contamination. In his essay *The Museum of Accidents*, Paul Virilio claims that the accident, the catastrophe, is especially privileged in modern, technological society, a society in which time—meaning temporal chronology—seems to end. "A society which rashly privileges the present—real time—to the detriment of both the past and the future, also privileges the accident" (2004). He found that a 2001 Sigma Study (an annual list of man-made disasters as well as natural catastrophes made for insurance purposes) reported, "[f]or the first time since [the study began in] the 1990s, a period when damage due to natural catastrophes predominated over man-made damage, the trend has reversed, with man-made damage standing at over 70 percent" (Virilio 2004).

Virilio is, here, articulating technologies that seem to accelerate time and annihilate space with modernization's obverse: the accident, death, destruction. While the annihilation of space by time is a condition that predates the internet as an essential part of capital accumulation, though the internet and networked media in general seem to 'realize' this condition most thoroughly with the desire for 'real time' and synchrony across vast distances. Virilio is not the only critical theorist to make this association. Achille Mbembe (2022) has also discussed this world-scale interconnection, calling it "planetary." This leads, he says, to a clash of time and a devaluing of life under capitalism. Even though we seem to be connected globally, Mbembe notes that this "sharing" in the market relies on a cosmology that accepts "a fundamental difference between the human subject and the world around it, between the human universe and the universe of nature, of objects and so forth," (2022) even though there are many alternative cosmologies that would refuse this individuality and isolation. "The epoch we have entered into," Mbembe argues, "is one of indivisibility, of entanglement, of concatenations," (2022) a state of being more commonly accepted by non-Western epistemologies. This interconnection is not totally 'positive,' and contains its own dialectical underminings, similar to Virilio's accidents.

> Times of concatenation presuppose that our bodies have become repositories of different kinds of risks, including those kinds of risks that not so long ago (and in many cases still) were thought to be the peculiarity of certain classes of the population—or 'races,' to use that infamous term. What used to only happen to some is now happening to more than just them (Mbembe 2022).

Being interconnected at a planetary scale means that all are increasingly subject to the same risks, anxieties, and accidents.

Virilio and Mbembe, and, as I'll return to in a moment, Nancy, together suggest how the "nuclear episteme" is one in which a planetary intertwining—an intertwining in which isolated disasters become equivalent and fungible, involving technologies to link the planet, an intertwining that reveals itself through the rise of global, planetary "accidents"—is about the potential of a spatial collapse, in which boundaries of nation-states are no longer central in containing and limiting the effects of technological rupture. And yet this spatial collapse also provokes extreme temporal confusion. Mbembe says, as for time, "I would go as far as to insist that more than any other time in our brief history on Earth, we are experiencing a clash of temporalities: geological time, the deep time of those processes that fashioned our terrestrial home; historical time; and experiential time. All these times now fold in on one another. We are not used to thinking of time as simultaneous. We think of time as linear: past, present, future. So how do we begin to think about time in a way that takes these concatenations seriously?" (2022). This means, I would suggest, an abandonment of 'futurity' as a space that legitimates political decision. Haraway too warns us against putting stock in the future. She writes that "[s]taying with the trouble does not require such a relationship to times called the future. In fact, staying with the trouble requires learning to be truly present, not as a vanishing pivot between awful or edenic pasts and apocalyptic or salvific futures, but as mortal critters entwined in myriad unfinished configurations of places, times, matters, meanings" (2016, 1). But, without a future, it seems that individuals today refuse their existence as "truly present." Instead, the evacuation of agency in the face of spatial interconnection and temporal confusion has led to a condition where death is a foregone conclusion (except for those few who choose, instead, to fight for immortality, to imagine oneself as a god who will live as a spirit in a machine).

4.

I noted above a necessary distinction between nuclear accident and nuclear war. This, I suggest, is because war, even if it leads to planetary annihilation, can be placed easily into historical narratives of victory and progress. War, as a historical phenomenon, guarantees a future. The accident does no such thing. As Nancy suggests, in differentiating between the horror of the bomb and the tragedy of the nuclear accident, "[w]hat Fukushima adds to Hiroshima is the threat of an apocalypse that opens onto nothing, onto the negation of the apocalypse itself, a threat that depends not just on military use of the atom and perhaps not even on

the sole use of the atom in general" (Nancy 2014, 21). This is true, as it gets to the futurity of war and the nothingness of the accident, but I want to explore Nancy's conflation of nuclear catastrophe and weaponry; of accident and war, of Hiroshima and Fukushima. And just as we must untangle the different implications of nuclear disaster and warfare, we must untangle the differences between history and time.

Nancy's writing *After Fukushima* grounds my argument concerning our negative hauntological moment. These grounds begin with Nancy's explanation that time has stopped. And if not stopped, time has become disastrous and disrupted because of the nuclear. So, even if there is a distinction between Fukushima and Hiroshima, as Nancy seems to suggest, this distinction is rendered insignificant in the ultimate exchangeability of all catastrophes. In this inconsistency—a singular moment of hedging in an otherwise sharp and concise piece of writing—Nancy seems, to me, to be struggling with his own position (or humanity's position) of being both dead and alive, both present and spectral.

Nancy begins and ends his essay by stating firmly that, today, there is an equivalency of all catastrophes. I quote here at length:

> Nuclear catastrophe—all differences military or civilian kept in mind—remains the one potentially irremediable catastrophe, whose effects spread through generations, through the layers of the earth; these effects have an impact on all living things and on the large-scale organization of energy production, hence on consumption as well. The 'equivalence' of catastrophes here means to assert that the spread or proliferation of repercussions from every kind of disaster hereafter will bear the mark of that paradigm represented by nuclear risk. From now on there is an interconnection, an intertwining, even a symbiosis of technologies, exchanges, movements, which makes it so that a flood—for instance—wherever it may occur, must necessarily involve relationships with any number of technical, social, economic, political intricacies that keep us from regarding it as simply a misadventure or a misfortune whose consequences can be more or less easily circumscribed[.] [...] The complexity here is singularly characterized by the fact that natural catastrophes are no longer separable from their technological, economic, and political implications or repercussions (Nancy 2014, 3–4).

I want to focus on the first line of this quote, and specifically the phrase, "all differences military or civilian." Nancy tells us that there is no difference in the catastrophe of Hiroshima and Fukushima, no difference

between military and civilian nuclear use, no difference between purposeful destruction and accidental disaster. The sheer force of the nuclear erases this difference and its technical, economic, and political intertwining, that continues to characterize all disasters today. He continues later in his essay, elaborating on the lack of distinction between names: "A proper noun is always a way to pass beyond signification. It signifies itself and nothing else. About the denomination that is that of these two names [Hiroshima and Fukushima], we could say that instead of passing beyond, they fall below all signification. They signify an annihilation of meaning" (13). The names 'Hiroshima' and 'Fukushima' speak less to specifics than to floating articulations of disaster, placed into a chain of equivalences that render details meaningless. Yet, Nancy does not downplay Hiroshima, does not downplay the specific atrocities of war, and takes his time in discussing the different apotheoses of human violence from World War Two, writing:

> The fact remains, however, that Auschwitz and Hiroshima are also two names that reflect—with their immense differences—a transformation that has affected all of civilization: the involvement of technological rationality in the service of goals incommensurable with any goal that had ever been aimed at before, since these goals embodied the necessity for destruction that was not merely inhuman (inhuman cruelty is an old acquaintance in human history), but entirely conceived and calculated expressly for annihilation (11).

Nancy, even though he links them, nonetheless distinguishes Auschwitz from Hiroshima. Even though both are, ultimately, expressions of a technological drive for humanity to destroy itself in the name of "progress," and both "serve the aim of political domination, which is also to say economic and ideological domination," the former was "a scheme for annihilating peoples or human groups by means of a systematically developed technological rationality" while the latter was "a scheme for annihilating entire populations and mutilating their descendants." (Nancy 2014, 10). Each resulted in different geopolitical arrangements of national power between the United States, Germany, Japan, and the Soviet Union (9). The 'futures' of Auschwitz and Hiroshima are distinct—for one, the future of the nation-state is enabled by genocide, for the other, the future of the nation-state is intertwined with radioactive mutation and military control.

So, even though he claims that all disasters are conflated, Nancy takes the time to differentiate these two atrocities. Perhaps this is because of Hiroshima's significance in initiating the "nuclear episteme." It is only

after Hiroshima that the "after" is itself called into question. But Nancy nonetheless desires to differentiate between different kinds of nuclear atrocity, as well. At the conclusion of his discussion of Hiroshima and Auschwitz, Nancy seems to have reversed, or at least warns his reader not to confuse, the differences between Fukushima (a disaster) and Hiroshima (a war atrocity). He writes, "[w]e must not in fact confuse the name Hiroshima—the target of enemy bombing—with that of Fukushima, a name in which are mingled several orders of natural and technological, political and economic phenomena" (13). Yet even accepting that it is the nuclear that has enabled the equivalence of catastrophes, this warning goes against his insistence of interconnected oneness. It is, he says, "not possible to ignore what is suggested by the rhyme of these two names, for this rhyme gathers together—reluctantly and against all poetry—the ferment of something shared" (14). The contradiction appears again. "As soon as we undertake this bringing together, this continuity, a contradiction seems to arise: The military atom is not the civilian atom; an enemy attack is not a country's electrical grid. It is here that the grating poetry of this vexatious rhyme opens onto philosophy: What can 'after Fukushima' mean?" (13). We return, here, to the primary argument of Nancy's essay: time has broken down; no longer with linear progression and promised futures or 'later on.' There is no after, only the time and space we currently occupy. The military atom is not the civilian atom. And yet, Nancy insists, "Equivalence means the state of forces that govern themselves in some way by themselves. Whether it is a question of a broken nuclear reactor or a bomb, whether the reactor or the weapon is more or less powerful, the excessiveness of their effects in space and time makes them equal to the excess associated with the means of controlling them and even more of neutralizing them" (24).

The equivalence Nancy refers to, however, is not properly one of identity; these disasters are not literally the same. The equivalence is one that relates to the imbrication of contemporary disasters in the global network of economic exchange, of scientific "progress," of the extraction of value from disaster, which could be framed in terms similar to Naomi Klein's "disaster capitalism" (2008). "Marx called money a 'general equivalent,'" Nancy claims, "[I]t is this equivalence that is being discussed here. Not to think about it by itself, but to reflect that the regime of general equivalence henceforth virtually absorbs, well beyond the monetary or financial sphere but thanks to it and with regard to it, all the spheres of existence of humans, and along with them all things that exist" (2014, 5). Catastrophes are now equivalent in the same way that money is a general equivalent through the fostering of exchange-value, absorbing and intruding into

all spaces once beyond the limits of capital. Yet this leads to a further problem: the fundamental contradiction of capitalism is the 'difference' between exchange-value and use-value. Money only serves as a general equivalent if one presumes a sense of value that excludes use-values. And the distinction between use-value and exchange-value is why we need the distinction between war and accident. War generates value through an industrial production of death—through the massive investment in weapons, in destruction, in the 'rebuilding' that happens after destruction (Mandel 1999, 274–309). War is "progress" for both capital and the nation-state. The accident, however, is the failure of progress. While many accidents can be reabsorbed by capital, the nuclear accident, in contaminating soil and water, in producing 'exclusion zones,' is a liability. The two don't factor into the balance sheet in the same way. While the potential to convert these catastrophes into exchange-value is possible given the endless capacity of capital to subsume that which is beyond its limits, the use-values of both are radically distinct. Not only that, is the only future here the future of capital? Of speculative investment? This speaks not to the exchangeability of catastrophes, but of the endless desire of capital to subsume. Perhaps this is where we might say that a world without a future is not inherently a world with an end or that has ended. Yet this requires one more move: the primary distinction I wish to conclude with, between the military atom and the civilian atom, in the production of differential use-values, is that one *creates* history and one *ends* it. This will, perhaps, lead towards a different sense of time without a future, one that does not need a future, but one that refuses the individuality of the ghost in the name of a renewed collective responsibility to the present. (When a ghost becomes aware that they are indeed dead, doesn't that change the entire plot?)

5.

I want to now turn to Walter Benjamin's theorization of history, and how linking Nancy's understanding of temporality 'after' the nuclear with Benjamin can help us rethink Nancy's contradictory approach to separating out, but combining, but separating the military and civilian atoms (nuclear disaster and nuclear war). For Benjamin, like Derrida, the past is filtered through a present which is always directed towards a future-to-come. What is 'past' is determined in the 'present' and only appears according to the needs of the present, which is not only about the "past" but about imagining a future to come in which past/present/future finally converge

through a messianic redemption. Benjamin writes, "In other words, our image of happiness is indissolubly bound up with the image of redemption. The same applies to our view of the past, which is the concern of history. The past carries with it a temporal index by which it is referred to redemption" (1968, 254). We are, he continues, endowed with a "weak Messianic power" in which our coming was promised.

However, this happiness and these promises are torn away when, as explained through Nancy above, there is no longer a conception of the future. Again, this is what I call "negative hauntology," which we might think of as an inversion of Messianic temporality that results in an extension of individualized imaginations of relations that can only begin and end in personal details. There is no more direction towards a future. We are always-already deceased, and the future manifests in the present as a determined response to a past that has already occurred. The future won't arrive because it is already closed, already determined by a fixed past which cannot be changed in the present.

Now, just because we are ghosts without happiness doesn't mean we are ghosts without history. Benjamin explains that the concept of history cannot be separated from the concept of progress. One creates the other. "The concept of historical progress of mankind cannot be sundered from the concept of its progression through a homogenous, empty time. A critique of the concept of such a progression must be the basis of any criticism of the concept of progress itself" (261). Progress is what moves, not time. Time without progress is homogenous and empty. If time manages to move without progress, it becomes stuck, as Nancy states we are, as I state we are. Filled time, progressive time, is simply history, our perception of events we deem 'historic' in our now-time. Benjamin continues: "History is the subject of a structure whose site is not homogenous, empty time, but time filled by the presence of the now [*Jetztzeit*]" (261).

Time is empty. It does not move. We cannot track ourselves with it alone. Time without progress, time without history, is ghostly time, negative hauntological time (and, I will assert, nuclear time, made possible only through first the nuclear bomb and then nuclear energy disasters which allow the conflation of all and ever-increasing disasters today). What moves is progress and what marks that movement is not time, but history. And what creates history? Events, calendar dates, memorials. "The initial day of a calendar serves as a historical time-lapse camera. And, basically, it is the same day that keeps recurring in the guise of holidays, which are days of remembrance. Thus, the calendars do not measure time as clocks do; they are monuments of a historical consciousness of which not the slightest trace has been apparent in Europe in the past hundred years"

(261). Progress drives history. As, Motoko Tanaka writes, "Once people realized that modernization and its byproducts could bring a totally new and unique history, the new dimension of 'the future' was born, and to get there they invented the vehicle of 'progress'" (2014, 13).

The dropping of the atom bomb can be considered the height of mankind's progress (Sloterdijk 1988). The ability to end ourselves is what we had been working towards since we began to work. Our progress was achieved in 1945, and then we attempted to distribute the progress more widely, through the cold war. Slowly, limits and conditions and treaties were placed on our progress and it faded into the past. If the 'big one' drops and mass extinction results, it is a very different form of destruction than any brought about by climate disaster. Although both are obviously caused by humankind, we often view climate disaster as the earth 'fighting back' or even ending itself in the face of our poor decisions. We refuse to put the same kind of global limits and conditions on the causes of climate disaster as we did on nuclear weaponry and energy sources. A growing sense of helplessness prevails. But as this was not the case for the nuclear, it became, in the light of the present, historical. We began to use this technology not for war, but for energy, and then in that guise, it turned on us. In both instances (nuclear weaponry and nuclear energy) it caused huge losses of life; illness beyond comprehension. But one was purposeful, 'progressive,' and 'historical.' The other was accidental, an error, halting, 'empty.'

Nuclear accidents produce not only empty time, but empty space. In his essay *Nuclear Borders: Informally Negotiating the Chernobyl Exclusion Zone*, Thom Davies writes of how areas like Chernobyl and Fukushima exemplify what Giorgio Agamben terms a "'state of exception'—a space where the normal rules of governance, state protection, and citizenship do not apply" (2015, 228). Citizens in these places, Davies continues, are abandoned and cast "outside the *de facto* protection of the state, and forces them to rely on informal actions and understandings of their nuclear landscape. It is within this context of abandonment that Chernobyl-affected citizens are compelled to employ unofficial understandings of space, and enact informal activities which circumvent their bio-political status of bare life" (229). For these areas we use terms like 'exclusion zone' and act as though they are places time cannot touch, places put on pause. This plays out similarly at Fukushima. For example, documentary filmmaker Kamanka Hitomi describes the psychological effects of inhabiting the compressed temporality of this sort of endless emergency, saying, "[i]t's as if people are living only by their reflexes, playing some sort of mindless video game. They no longer think in terms of contexts and nar-

ratives; there's no sense of history, or reflecting on cause and effect within the flow of time and the particulars of chronology. What we're seeing is the proliferation of a style of living only with what is right in front of one's eyes" (Long 2018, 5–6). Exclusion zones are where the disaster of progress, its undoing and failure, is most evident. They become non-spaces; they are 'empty time.' We cannot remember in these spaces. Because of this undoing of progress, they contain no history, and so we forget them, do not memorialize them in the same way we do the areas of nuclear bombings, and the victims of nuclear bombings.

Meanwhile, the ultimate progress of the nuclear bomb has created an unshakeable history. It is hard to think about the threat of nuclear bombs outside of the cold war, outside of a historical past. There are memorials to the bomb, even in places far beyond its direct impact. As Benjamin explains, only progress creates and drives history, and so a failure of progress, like the breakdown of nuclear energy, stops time. This is what Nancy says as well, because of Fukushima, because we are 'after' Fukushima, we no longer have a future or a promise of time moving in a linear manner.

The culmination of extreme neoliberalism and late-stage capitalism (which will have no culmination other than mass extinction) has created an untenable way of living in which we, as atomized individuals holed up in our houses taking in constant stories of misery and social decline become crazy and miserable. But the response to this isolation cannot be to attach to the minutia of daily life, as if pets, hobbies, and favorite foods will manage to perform individuality as the temporal horizon appears to wane. We cannot regain 'history' by asserting that these traces mean we were once real. As Fredric Jameson asks, "how to project the illusion that things still happen, that events exist, that there are still stories to tell, in a situation in which the uniqueness and the irrevocability of private destinies and of individuality itself seem to have evaporated?" (1992, 87). The hyper-individualizing of the internet, of social media, is an effect of the failure to individuate, in which the performance and differentiation of the self from others constantly fails (Bollmer and Guinness 2017). The ghost is an attempt to regain a failed individualism, and the modern ghost story, for Jameson, is a particularly bourgeois form, with ghosts inherently "at one with a building of some antiquity, of which it is the bad dream, and to whose incomprehensible succession of generations of inhabitants it makes allusion as in some return of the repressed of the middle-class mind. Not death as such, then, but the sequence of such 'dying generations'" (1991, 90). Ghosts forget who they were, they forget their own pasts, and instead attempt to become present through a faded attachment to material goods. Jameson asks: "Without a past, can we even continue to

appeal to a shared present?" (1992, 92). But we must become present, not as a ghost, but as collectively oriented individuals who live in the present, without a guaranteed future. Living in the present as if one is deceased is a question of temporality, and how we imagine and understand the role of the past, present, and future in the wake of the nuclear.

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Melanie Le Touze
and Zackie Schneyders

The Brennilis plant, A Nuclear Ghost at the Gates of Hell

The following is an excerpt from our ongoing project on the Brennilis plant in the Monts d'Arrée in Finistère, France, which has been a nuclear ghost since 1985. The project combines photography, interviews, and philosophical reflections. It aims to show how the myths and legends of Brittany (France) overlap with the lifeworlds of inhabitants around the Brennilis plant in an effort to highlight the impact nuclear technology has on its surrounding area. We juxtapose this documentation with sociological, philosophical, and literary reflections. In converging these elements the project combines each aspect to create something new altogether. Our approach is echoed by the use of Lomography, a photographic technique that admits flaws and blurs, heavy vignettes, unusual lightening, apparitions and tinctures, illuminating those haunting aspects and ghostly traces in lived environments less obvious to the unmediated eye. As typical with all ghostly matters, ours is a work still in progress.

Nuclear power is the leading source of electricity production and consumption in France, with 56 reactors spread throughout the country. Currently, France is in the midst of a debate about the revival of the civil nuclear industry with a new programme announced by the President in 2022. A regular topic in the media, the debate is fuelled by problems linked to climate change such as the scarcity of water, a resource needed in huge amounts for the cooling of nuclear reactors. Security issues are also causing people to reflect on the wisdom of using nuclear power. How safe are nuclear sites in the face of climate disasters, terrorism, or war?

What about our energy needs and dependencies, an issue crystallised by the current inflationary crisis linked to the war in Ukraine? Who decides on the location for a nuclear plant? And how do residents react to such decisions? Nuclear power plants are not only the result of technical considerations, but they also have an impact on collective memories, forms of organisation, and on the experiences of those who live near (and not so near) by. These questions have led us to reflect on the past, present, and future of the first nuclear plants in France.

Figure 1. *Full moon*, Lake Saint-Michel, January 2020.

On raconte qu'il est des lieux où parfois
la réalité prend des allures particulières.
Des lieux, où l'esprit se perd
entre le vrai, et le possible.

– Chartier (2014, 55)

It is said that there are places where sometimes
reality takes on a particular aspect.
Places, where the mind gets lost
between the true and the possible.

To come to the Monts d'Arrée mountain range is to set foot into an 'elsewhere.' The territory is at the heart of Penn-ar-bed, the end of the world in Breton, or the '*Finistère*' on the most westerly point of France. It is a unique environmental, social, and historical area, characterised by its low population density, exceptional biodiversity, an age-old rural way of life adapted to these particular conditions, and its ancestral culture of myths and legends. Till this day, Breton is spoken by a large proportion of the population.

It is a place where the so-called 'modern' and 'ancient' world coexist and confront each other, generating paradoxical and striking narratives for those who know to observe them. This small piece of Brittany also saw the appearance of what would become one of the first French nuclear ghosts: In 1962, an experimental heavy water nuclear power plant was built by EDF (Électricité De France) in the communes of Brennilis and Loqueffret. Located on the edge of the Nestavel Dam which regulates the waters of the artificial lake Saint-Michel, it was shut down in 1985 and has been in the process of being dismantled ever since.

The impact of the nuclear plant can be seen at different levels of society. Relatively speaking, we all live next to nuclear power plants, more or less aware of their activity. Whether we hate them, defend them, or fear them, they visibly exist in our environments and have transformed those environments over the last 60 years. Nuclear power plants have influenced science from experimentation to the development of advanced technology, they are objects of pressure and authoritarian threats. Politicians are talking about shutdown or revival, reconstruction or dismantling, burial or orbiting of waste. Nuclear power plants, in other words, create tales of anticipation, atomic scientific hegemony, or post-nuclear frights, provoking questions about control or potential accidents. They will continue to impact living beings for centuries; playing with our imagination and thoughts, even if they, and their products are not always visible. In any case, what is certain, is that the nuclear ghost is already haunting us.

Since 2020, intrigued and magnetized by these chaotic perspectives, we, Zackie Schneyders, photographer, and Melanie Le Touze, lecturer at the University of Nantes, have gone to meet this region well-known as a land of warm welcomes. During a visit, we encountered many people and realized that the nuclear ghost in Brennilis reactivates the myths and legends of this region in Brittany, partly fed by the communication games between transparency and opacity of the authorities and EDF. Accordingly, we tried to approach the subject of this territory and its nuclear power plant as a social fact[1] which is interpreted in perceptions, stories, and organisations. We started to collect the stories and imaginaries of the

1 Bretesché et al. 2021 describe the socio-historical, linguistic and social dimensions of nuclear issues.

inhabitants of these places around the power plant. In addition, our work is informed by newspaper articles, documentaries, public documents from EDF, and meetings with anti-nuclear or environmentalist groups in the region. All of the views are themselves superimposed with our own views, which are ostensibly "external" to the region.

In this sense, the stories we collect are mixed with what this environment evokes for us and which we translate into lomographic and analogue images, where photographic fiction sometimes catches up with reality through experiments. In addition to the use of her regular analogue camera, Schneyders composes images with the lomographic camera, which is made entirely out of plastic, without cells or electricity, and thus must be used in an instinctive manner. Seeking the photographic accident by using 120 mm film, a 6×6, and a lens cap to distort the exposures, her work provokes a confrontation between the visible and the invisible, resulting in unpredictable outcomes.

Figure 2. *Overexposed image from the nuclear power plant of Brennilis, the lake Saint-Michel, the marsh, the sailing school, and the edge of the Nestavel Dam.* March 2023.

We invite audiences to step into these unplanned images and legends, in order to transcend the rational pros and cons of nuclear debates; instead playing with the contradictions that arise from these poetics. We willingly lose ourselves in these experiments, while finding different paths to share the questions that have aroused our curiosity: what narratives are created after so much time spent living with a nuclear ghost? What kind of new narratives are created, mixing old legends with new technologies? To which (and whose) past, present, and future imaginations do they appeal? What can these local representations tell us about wider perceptions of current issues in the world? In line with this set up, our project is produced entirely on an experimental basis. It is a means of crossing multiple viewpoints and revealing the questions that have guided our approach, but which also emerged during various spontaneous meetings.

Figure 3. *Night of mayor's wishes, Brennilis village.* January 2020.

Figure 4. *Church of the Saint-Michel de Braspart, in reconstruction. Landscape after fire in 2022.* March 2023.

During the summer of 2022, a fire destroyed a big part of the Monts d'Arrée, creating a post-apocalyptic landscape. These photos show the burnt landscape and the small church of the Mont-Saint-Michel de Braspart which was also destroyed by the fire in 2022.

Living in the Monts d'Arrée Mountain Range: The Relationship Between Residents and their Environment

Il était une fois, dans la lande bretonne, le long de la rivère Elez, entre 200 et 300 mètres d'altitude, une région tranquille peuplée d'elfes et d'animaux sauvages, au pied de la modeste montage Saint-Michel, où s'alanguissaient quelques communes qui ne demandaient rien à personne : Brennilis, Botmeur, Loqueffret, et La Feuillée. […] *Avant d'en venir au nucléaire, il faut rêver un peu et raconter à quel point cette Bretagne de landes, de granit et de légendes, est belle.*

–Vadrot (2012, 1)

Once upon a time, in the Breton moors, along the river Elez, between 200 and 300 metres above sea level, there was a quiet region populated by elves and wild animals, at the foot of the modest Saint-Michel Mountain, where a few communes that asked nothing from anyone lay: Brennilis, Botmeur, Loqueffret, and La Feuillée. […] *Before coming to the nuclear issue, we must dream a little and convey how beautiful this Brittany of moors, granite, and legends is.*

Figure 5. *Dawn in the land, Youn Elez.* January 2020.

Des monstres s'arrachaient à l'argile
Pour un rugissement silencieux
Souvenir de quand le chaos régnait
Des pics surgissaient, des abîmes s'ouvraient
Feu, foudre,
Eaux et tempêtes
Le monde allait commencer
Les Monts d'Arrée s'élever à huit mille mètres
Il s'étaient refroidis maintenant
Dégonflés peu à peu
Il n'en restait que les os
La structure essentielle

–Tangi (2003, 21)

Monsters ripped from the clay
To roar silently
A memory of chaos rules
Peaks surged, an abyss opened
Fire, thunder, water, storm
The earth is birthing
The Monts d'Arrée rise up to 8000 metres
They have cooled now
Shrunk little by little
It's only the bones that rest
The essential structure

To understand Breton mythology and legends it is necessary to retrace the various paths of hybridization that occurred in the history of the peoples in Brittany via the Gauls, Celts, and Christians. These stories of domination, protest, and resilience overlap.

Figure 6. *After an emergency alarm, around Saint Herbot.* January 2020.

The nuclear station is one of the thorny issues when you live here. Because here, we are on a site that has a very particular place on a historical scale. That is to say, it's a history that revolves around the Celtic peoples, who transmitted their stories through oral tradition; they did not write anything down. The basin in which the nuclear power station was built in the sixties, is one of the places that could be described as 'energetically negative' [in Celtic logic]. The Yeun Elez marsh was a place that was vigorously studied, revered, controlled, and used by the druids. But these are "notions that don't fit with modern science today. It is a place of great

electromagnetic incidence. But in the 1960s, when it was decided to build a nuclear power plant there, it was the same time when they didn't care about the life in the ground. But in fact, this plant has never been able to function properly. […] Yeun Elez is the place where the philosophy of here is linked to the observation of nature, and both are in opposition to the modernism of the sixties" (B., resident).

> "Before the nuclear station was built, we had a meeting in the village. And to the one who was against it, I said: what about you, if you're in the hospital and suddenly there's no electricity, what do you think about that? And what about the agricultural machinery, in your opinion, how does it work? I never feared the nuclear station" (A., resident).

> "And while I was cleaning the public toilet, a couple talked to me. They were tourists and they asked me about the nuclear power plant and told me better not to get in contact with the water. I asked them why they came on holidays here if they fear the nuclear plant. There was never a problem with that nuclear plant" (A., resident).

Électricité De France (EDF) Shows You the Way.

On the site of the nuclear reactor, there is also the *Maison du Lac*. In this EDF information centre, we discover what EDF and other actors have done to rehabilitate the fauna and flora of the lake, as well as the confidence people have in the quality of this environment. Flyers, used as highly effective communication tools adapt information about the nuclear reactor to local narratives: "Brennilis, a legend that can be visited all year round." The image of the power station surrounded by carefree deer invites us to appreciate it for what it would be then, a part of Brittany incorporated into its identity; it's 'magic.' By using the terms "inescapable and majestic" or "perfectly integrated, harmless and invisible," we can quietly forget about the existence of the nuclear reactor'.

> "So, you're talking about the publication made by the Armorique Regional Nature Park. The lake is a popular subject for photographers, though the power station is usually left out 'of the frame'. It's always photos with skewed angles where the power station never appears" (B., resident).

Figure 7. *Overexposed images from the nuclear power plant of Brennilis, the lake Saint-Michel, the marsh, the sailing school, and the edge of the Nestavel Dam*. January 2020.

"I told you that I am a fisherman. But the lake around the power plant, I don't fish there. It is the cooling pond of the nuclear power plant. There have been exceptional floods and the water from the floods has invaded the power station's waste storage area. The storage facilities are watertight, but afterwards we can either trust them or not. The lake could be contaminated. And what do we do with this lake: the biggest fishing spot in Brittany? And next to it, they have created a youth centre: a day-care centre and a sailing school. And people consider that if they have created a sailing school, it is proof that there is no risk. It's a proof by the absurd, you understand what I mean?" (B., resident).

"We are waiting for the government's decree to start the work [of dismantling the reactor]. When we start, we estimate that it will take 17 years to complete the work. At the end of the 17 years, there will be nothing left, there will be no trace of what remains today in the landscape" (Maison du Lac, EDF guide).

The Monts d’Arrée Mountain Range: Land of Paradoxes

Thought is addressed and associated with image and memory, with the challenge of reifying the nuclear age, its paradigmatic change, and the emergence of atomic deterrence. This specific thought is elaborated by various media formats: science fiction literature haunted by the last survivors, or by the myth of the absolute weapon of destruction, comics and their superheroes doped with radioactivity, manga and the reiterated trauma of Hiroshima and Nagasaki in 1945, cinema, series between prefiguration and metaphor, music and its anticipation of the apocalypse, and finally, the video game, which explores post-apocalyptic landscapes with resilience. The stories rehearse the arguments of the anti-nuclear protests in Brittany since the seventies. The most emblematic example, the protest of Plogoff. Brennilis, which is geographically located on one of

Figure 8. *A Photographic Accident*, next to Lake Saint-Michel, January 202

the gates of hell, is featured in Fournier's comic strip from the adventures of Spirou and Fantasio, *L'Ankou* (1977). The Ankou, a character in Breton mythology, appears on the cover of the comic strip while to its right the nuclear power station of Brennilis explodes. The Ankou collects the souls of the dead and deposits them in Yeun Elez, the clay field that lies between heaven and hell and now around the Brennilis nuclear station. This mixing of the nuclear station of Brennilis with Ankou and other legends of Brittany is repeated in *Bran Ruz*, a comic from Auclair and Deschamps.

Figure 9. EDF campaign, the caption reads: "It's not science fiction, it's just science"

Affected from the outset by ambivalent imagery, nuclear power lends itself to an imaginary projection of the hopes and fears of each era, with aesthetics varying according to the decades and their references to accidents, wars, or disaster. Thus, nuclear power crystallizes images of Promethean omnipotence and regeneration on the one hand, and of apoca-

lyptic catastrophe and total loss of control on the other. A mixture of fantasies and realities structures the ambivalent imaginations surrounding nuclear energy. The question remains: What is this nuclear ghost able to tell us?

Melanie Le Touze is lecturer for the German Academic Exchange Service at the University of Nantes in France. In her studies of Romance languages and literature and history at the Heidelberg University she started to be interested in myths and legends of Brittany and Basque country. Her research focuses on intercultural studies, foreign language didactics, and current topics from Romance studies.

Zackie Schneyders is a photographer, who works for sociocultural associations and artists in Belgium. Her camera focuses on collectives, social projects, and regions where people are fighting to protect their environments. Rather discreet in personality, she prefers to take a backseat and let people tell their own stories.

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Elva Österreich

Experiencing the Trinity Test in New Mexico

What is a ghost? Is it a continuing spirit through time that refuses to die? If so, that is what my book, The Manhattan Project Trinity Test: Witnessing the Bomb in New Mexico, is about—the legacy of the first atomic bomb, set off in the southern New Mexico desert, 5:29:45 a.m. on July 16, 1945. Known as the Trinity Test, this event, happening almost 80 years ago, has been called the dawn of the nuclear age.

For the 60th anniversary of that first atomic bomb in 2005, the newspaper I was working for, the Alamogordo Daily News, brought the staff together to dig out the stories our paper had printed regarding the event and to write new stories for a special edition. I put together a replica of the front page of that long-ago style of the paper, bringing all those elements together. It was that project which made me realize as the event falls back into history, those people who experienced it and were affected by it are rapidly disappearing. Thus, the idea for the book was born and I started talking with those who remember and who are still alive today as well as their children. I also worked to unearth the words and experiences of those no longer alive—the scientists and journalists, for example, who had left written accounts and other pieces to sort through.

The resulting book encompasses ideas, thoughts and experiences of some of those who were on the ground in southern New Mexico. The following passages are gleaned from the book itself and the research I did to put the book together. I attempted to paint a picture of the individuals on the ground in Southern New Mexico at the time to illustrate what happened when the Trinity Test occurred and some of the issues they faced.

Figure 1 The only known color photo of the trinity Test, taken by photographer Jack Aeby, public domaine, provided by Jim Eckles.

Were the people of the Tularosa Basin and surrounding areas victims? Most did not think so at the time, although many today believe they were. In his book *You Take the Sundials and Give Me the Sun* Tularosa Basin historian David Townsend makes the point that it is the people who saw the atomic bomb first who are rarely asked if they were victims:

> Few of them would consider themselves victims, yet in a broad sense they were. They were located in close proximity to a dangerous experiment; not informed of the danger in which they were being placed, let alone the nature of the experiment; and deceived for a period of weeks about the danger in which they had been placed (Townsend 1984, 144).

In Townsend's account these witnesses "remember the light above all else, above the noise, above the tremors, above everything" (147).

Townsend continues:

> One minute it was dark; then it was bright as day. The light faded gradually into what seemed a deeper darkness. Then the sound, not much noisier than distant thunder, and the tremor that rattled windows and

> dishes. The first thoughts were religious: the end of the world; the next, practical and reflective of wartime thoughts: they have sabotaged the train, or blown up the base, or.... Those who went outside to see what had happened were treated—or condemned—to a view never seen before by man. A giant column of smoke with light gradually dying down its stem was visible in the re-gathering darkness. As this false dawn was dying in the west, the true dawn was giving a hint of a purer light from the east. That picture stuck in the minds of the witnesses, indelibly imprinted (147).

"It was as if the air had died," one woman, Clara Snow, told Townsend. Then the silence came (Townsend 1984, 147).

Figure 2 Trinity Site in 2018, photograph by Elva K. Österreich.

When I started the book I had to make clear that what I was documenting was not about fact but rather about experience—more so, it was remembered experience. People experience and remember things differently. And to make matters worse, those memories get transmitted in second-

and third-hand ways, sometimes to the point that they don't even make sense.

For example, in a written account found at the Tularosa Basin Historical Museum, John Buckner wrote, "Helen Keller and her companion were traveling across the southern part of the state and when the light went over, she turned to her friend and said, 'What was that?' To anyone, not familiar of her, she was totally blind" (The Manhatten Project Trinity Test Site)

It turned out, Helen Keller was a lot of things — deaf-blind author, political activist, and lecturer. But she was not in a car driving through southern New Mexico at 5:35 a.m. on July 16, 1945. There was, however, an eighteen-year-old woman, Georgia Green, who was in a car with her brother-in-law, Joe Wills, on their way to Albuquerque from Socorro for an 8:00 a.m. music class. Green was blind, although she could perceive a little light and dark distinction, and reportedly saw the bright light at that time. Green's sister Elizabeth Ingram was also in the car and said, "We saw this great big flash of light, and my sister, she said, 'What happened?' It seemed like it lit up the whole prairie all around us"[1] (see Else, 1981).

Respecting these different narratives, I had to write from the point of view of various realities. I asked my readers to take each version on its own merit and suspend an expectation of clear-cut facts in favor of a more subjective reality.

The goals of the top-secret Manhattan Project to build and deploy atomic weapons was to bring about the end of World War II. A letter to President Franklin Roosevelt, sent in 1939 by Albert Einstein (written by Leo Szilárd and signed by Einstein), led to the development of the Manhattan Project. Einstein's letter convinced the president of the need to develop nuclear weapons before the Germans could do so. Other countries had already begun research on an atomic bomb. The atom had been split for the first time in 1938 in a Berlin laboratory, and nuclear fission was understood by the world's scientists.

In the city of Los Alamos, in northern New Mexico, a secret scientific laboratory was established under the direction of J. Robert Oppenheimer. The purpose of this facility was to design and assemble the actual uranium- and plutonium-base atomic weapons. The site was selected in late 1942 by Oppenheimer and Los Alamos became a top-secret city. The first contingent of scientists arrived in March 1943. By June, 250 scientific personnel worked on the physical, chemical, and metallurgical aspects of the bomb's development.

1 I could confirm this twist in the story by multiple sources, including a brief, informal conversation I had with Green's own aunt.

The site for such a test had to be isolated, have good weather conditions, relatively level terrain, and be within a day's drive of Los Alamos. After looking at eight potential sites, officials chose an eighteen-by-twenty-four-mile section of the northwest corner of the Second Air Force's Alamogordo Bombing Range (now part of the White Sands Missile Range). The site, located in what is known as the Jornada del Muerto (Journey of Death), is flat, desolate and semiarid.

Oppenheimer gave the area the code name "Trinity," reportedly inspired by a poem by John Donne called "Holy Sonnet XIV: Batter My Heart, Three-Personed God," which begins:

Batter my heart, three-personed God; for you
As yet but knock, breathe, shine, and seek to mend;
That I may rise and stand, o'erthrow me, and bend
Your force to break, blow, burn, and make me new.

At Ground Zero, a 102-foot tower was erected, about 25 feet square at the bottom and 15 feet square at the top platform. Completed in mid-June 1945, dry-run tests began in early July. On the evening of July 13, the bomb's high explosive assembly arrived from Los Alamos at noon. The bomb, nicknamed the Gadget, was assembled. At 4:45 a.m. on July 16, an arming party closed the arming switches at the base of the tower. This was the last visit to Ground Zero before the test. Some even thought that the Trinity Test might "ignite" the earth's atmosphere, eliminating all life on the planet. Less wild estimates thought that New Mexico might be incinerated. At 5:29:45 a.m., the world's first atomic bomb was detonated with the force of approximately twenty-one kilotons of TNT above the desert of southern New Mexico.

We were twenty miles away, others were closer, six miles away, they gave out dark glasses. I thought, "I ain't going to see a damn thing through dark glasses." The only thing that can really hurt your eyes is the ultraviolet light. So, I got behind a truck windshield so the ultraviolet can't go through glass and that would be safe and so I could see the damn thing.

The time comes, and there was this tremendous flash out there. It was so bright. And I see this purple splotch on the floor of the truck, and I said, "That ain't it, that's an after image," and I look up. I see this white light, changing into yellow then to orange. The clouds form, and then they disappear again. The compression and the expansion forms

> *and makes clouds disappear. Finally, a big ball of orange at the center so bright it became a wall of orange started to rise and billow a little bit and get black around the edges, and then you see it's a big ball of smoke with flashes inside with fire going.*
>
> *And I saw all that took about one minute—a series from bright to dark, and I had seen it. I'm about the only guy in the world who actually looked at the damn thing. Everybody else had dark glasses. The people at six miles couldn't see it because they are all told to lie* [on] *the floor … I'm the only guy who saw it with the human eye.*
>
> *Finally, after about a minute and a half, suddenly there is a tremendous noise, bang and then rumbles like thunder, and that's what convinced me. Nobody had said a word during this whole minute, we all were just watching quietly, but this sound released everybody, released me in particular. Because the solidity of the sound at that distance meant that it really worked. The man who was standing next to me asked, "What's that?" when the sound went off. I said, 'That was the bomb.'*

—Richard Feynman theoretical physicist on the Manhattan Project, 1975 University of California, Santa Barbara lecture.

> *And just at that instant there rose*
> *from the bowels of the earth*
> *a light not of this world,*
> *the light of many suns in one.*

—William L. Laurence (on-site as the only journalist allowed at the explosion and later wrote several accounts of it. He was also present for the bombing of Nagasaki, ultimately earned two Pulitzer Prizes and is credited for coining the term the "atomic age.")

The Trinity Test was heard across southern New Mexico, rattling windows as far away as the mining town of Bayard (about 150 miles from the site) where a hospital official was confused by the rattle.

Figure 3 A replica of the casing that housed the atomic bomb set off at the Trinity Site July 16, 1945, shown at The National Museum of Nuclear Science & History in Albuquerque, New Mexico, photograph by Elva K. Österreich.

Outside of the immediate communities of New Mexico's Otero, Socorro and Lincoln Counties, other people experienced the Trinity Site explosion in their own areas. Across mountains and deserts, people felt, heard, or saw effects. The flash of light was reportedly seen in the cities of Albuquerque, Santa Fe, Silver City, Gallup, and El Paso, Texas.

> *I looked over to the west—it's bright over there, it kept getting brighter. It was getting real bright. I went back in the house and called Mother. I said, "Mother, Mother!"*
> *"What?"*
> *I said, "The sun is coming up in the west."*

> *She didn't believe me and said, "Do your chores, you've got to go catch that bus, go take your physical." She'd signed the papers at 17 for me to get in.*
>
> *I said, "Mother, it's coming up in the west!" I went back out there and I said, "Come look and see."*
>
> *And I'll never forget that. She walked out at the east and she looked back in the west and said, "Oh my God!" went back in the house and never said another word.*

—Altus Boulden, born 1928, was out feeding the chickens at his home near Hope, New Mexico, almost two hundred miles east of Trinity Site, when he saw light in the west.

Because of the top-secret nature of the project what happened at the Trinity Site was not released to the public as anything but "a munitions dump explosion" in a press release.

"A remotely located ammunition magazine containing a considerable amount of high explosives and pyrotechnics exploded. There was no loss of life or injury to anyone, and the property damage outside of the explosives magazine itself was negligible. Weather conditions affecting the content of gas shells exploded by the blast may make it desirable for the Army to evacuate temporarily a few civilians from their homes," was the statement released on July 16 by the commanding officer at the Alamogordo Army Air Base, now Holloman Air Force Base. The statement was reflected in newspapers around New Mexico and recounted in an Oct. 5, 2018 Alamogordo Daily News story, "The Atomic Age: Three men and a bomb" written by Arlan Ponder, a public information officer at the base.

It was not until the bomb was dropped on Hiroshima, Japan, on Aug. 6, 1945 that many of those who experienced something in New Mexico understood what had happened.

Following the test, amidst the confusion, one of the strange phenomena reported at multiple locations from farmers, ranchers, and even town community members was a color change in the coats of various animals in the region and also some people.

> *…we had quite a few cattle that were lying down and asleep at that time, and the side facing the blast—these were Hereford cattle, they were red in color—the side facing the Trinity Site turned white, and several of the sheepherders that were closer, who had black beards—*

> *they were all young people—their beards turned white. We had one black cat, in particular, that I know of, that turned white.*

—Rancher's son Holm Bursom III

Such stories came from the ranchers of the Tularosa Basin, the Jornada del Muerto, and the mountain ranges (San Andres and Oscura) that separate those areas. In the late 1800s, many of these ranchers came to New Mexico from Texas looking for land to call their own and vast grasslands to raise their cattle.

The McDonalds—great-grandparents of the McDonald clan who owned three area ranches, including the Schmidt/McDonald house where the bomb was assembled, two miles from Ground Zero, and the base camp ranch house, nine miles from Ground Zero—traveled from south Texas on a wagon train between 1881 and 1882.

Homesteads grew across the basin and the hills, where people put their homes and were able to lease the right to use federal and state lands for grazing. In 1942, the government sent those ranching families packing to claim vast swatches of land for military purposes in the face of World War II. People were offered compensation for the loss of land but often did not receive the full amount they were promised. Regardless, they lost their homes and lives on the range that they had worked so hard to grow.

Figure 4 The McDonald Ranch House where the bomb was assembled, as pictured in 2018, photograph by Elva K. Österreich.

And then there are those in the Tularosa and Socorro areas who today still fell they were guinea pigs in the aftermath of the Trinity explosion. This is a reference heard and seen in various accounts from those who feel there should be some recompense, or at least recognition, for the health hardships that seem to be a result of radiation and fallout in the areas involved.

In July 2014, Tularosa Basin Downwinders Consortium cofounder Tina Cordova told Alamogordo Daily News reporter John Bear that those living near the Trinity Site in 1945 "were guinea pigs in the world's biggest science experiment. That part of the history of Trinity has never been told" (Bear 2014).

This consortium has been active since 2005 seeking recognition and compensation for the damage done to the families due to the Trinity Test. They claim increased incidence in cancers and infant mortality following the test. While other nuclear test site downwinder residents have received acknowledgment and families have received funds for their troubles, including loss of family resources in the form of poorly compensated land as well as medical ailments, the top of which is cancer of various types, those in the vicinity of this first atomic bomb have not been validated by the government in any way. They continue to lobby and hold events in recognition of the loss in their families and legacies. On July 27, 2023, the United States Senate passed the Radiation Exposure Compensation Act amendments as part of the National Defense Authorization Act that would add the Downwinders of New Mexico to the fund for the first time ever.

There are many people still today who believe the test and subsequent bombings were the right thing to do. These people say the lingering results, cancers and damaged families, are part and parcel of the cost of war and they will not participate in the actions of the downwinder group. The feeling, and the position of President Harry Truman, who ordered the bombs dropped on Japan, is that the bomb ended the war and saved the lives of thousands of American soldiers.

> *It was a terrible decision for me to make, but I made it. And I made it to save 250,000 boys for the United States, and I'd make it again under similar circumstances.*

—President Harry Truman commenting on the decision to drop the Hiroshima bomb in a 1948 letter to his sister Mary.

But not only is the act of dropping the bombs on Japan by many considered to have constituted a war crime and the addition of Nagasaki without purpose, but it is also generally known today that the Japanese were ready to surrender before it happened, possibly already had done so.

> The use of [the atomic bombs] at Hiroshima and Nagasaki was of no material assistance in our war against Japan. The Japanese were already defeated and ready to surrender because of the effective sea blockade and the successful bombing with conventional weapons…The lethal possibilities of atomic warfare in the future are frightening. My own feeling was that in being the first to use it, we had adopted an ethical standard common to the barbarians of the Dark Ages. I was not taught to make war in that fashion, and wars cannot be won by destroying women and children.

—Fleet Admiral William D. Leahy, Chief of Staff to President Truman, 1950, as quoted from his book "I was there".

Figure 5 Numerous interviews, stories and remembrances are recorded every year during the two open house days at White Sands Missile Range when people can visit the site of the Trinity explosion, photograph by Elva K Österreich.

Elva K. Österreich has been a journalist, photographer, and editor in Southern New Mexico for 20 years. She has written numerous articles about the state's history, people, and environment for newspapers and magazines. Falling in love with the people and the history of the area, she especially loves the stories she hears from the old-timers and is fascinated by the way folks used to live and their experiences. Combining her interest in the people of the area and the immense power and effect of the Trinity atomic bomb explosion is a natural progression into exploration for Österreich.

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Theresa Meerwarth

Gabriele Schwab's *Radioactive Ghosts*: A Review

The Russian invasion of Ukraine, the release of treated radioactive water from the Fukushima nuclear power plant into the Pacific Ocean as well as Christopher Nolan's much anticipated blockbuster *Oppenheimer* have reignited public conversations about nuclear threats. In January 2023 the *Bulletin of the Atomic Scientists* set the Doomsday Clock, the symbol for human self-destruction, at 90 seconds to midnight, the closest to apocalypse it has ever been since its creation in 1947, and polls report that fears of a nuclear holocaust have surged to the highest level since the end of the Cold War. Despite this renewed interest in nuclear weapons and nuclear catastrophes, public attention to existential threats of the nuclear age is still seeped in a sense of apathy, rather than political demands or public upheaval.

Responding to these myriad complexities and issues, Gabriele Schwab's 2020 book *Radioactive Ghosts* is a timely study tackling the unfinished history of the nuclear age. The book is haunted by ghosts of past nuclear catastrophes and ghosts of possible future apocalypse. Traveling the paths of academic discussion and autobiographical recollection simultaneously, Schwab explores how the nuclear age leads to the formation of what she calls "nuclear subjects" pointing to subjectivities that are tethered to a traumatic haunting from the past and future and which address the repressed nuclear violence "that profoundly shapes our being in the world" (2020, xi).

Schwab's specific invocation of the ghost produces a variety of apparitions, combining the ontological and epistemological insecurities of the atomic age with the intimate ruptures of psychic life, and zooming in on

the different scales of apocalyptic and post-apocalyptic experiences. As such *Radioactive Ghosts* sits well within a rich cultural studies tradition that employs the ghost as a tool for critical thinking: As a "figure of return" (Blanco and Peeren 2013) the ghost questions linear temporality of past, present, and future. Ghosts also reveal what is hidden from sight, most aptly to shine a light on injustice, violence, and repression (Gordon 2008). The ghost hence troubles distinctions between visibility and invisibility, presence and absence and is far from distinct to the political realm of human existence. With a nod to Achille Mbembe (2003), the ghost points to the political marginalization of the 'living dead', who are simultaneously abused by and uphold the racist-capitalist system that has turned them into disposable outsiders and 'ghosts' in the first place. Following Derrida's 'hauntology,' ghosts also trouble a permanent notion of being by invoking questions about temporality, revelation, or justice. Accordingly, *Radioactive Ghosts* leads readers through an array of critical investigations, unpacking the nuclear in relation to race, gender, colonialism, ecology, and even posthuman transspeciesism. The book is an intriguing study within the field of nuclear criticism, highlighting the intricacies of psycho-political consequences in nuclear politics.

Drawing on Achille Mbembe's 2019 book *Necropolitics*, Schwab develops the concept of 'nuclear necropolitics' as a theoretical anchor, expanding on Mbembe's discussion of sovereignty and the power over life and death. Nuclear necropolitics, Schwab argues, inaugurate a new form of 'slow violence' that affects human subjects both physically and mentally. She writes, "[t]he power of nuclear weapons can now be used to dictate not only who may live and who must die from a nuclear attack but also how some people must live with and die a slow death from the lingering effects of nuclear contamination" (2020, 18). In this sense, the creation of 'sacrifice zones' for atomic weapon tests or resource extraction are examples of nuclear necropolitical violence. To Schwab this demonstrates that in the nuclear age human lives are unevenly valued precisely because nuclear sovereignty designates specific populations and territories as disposable. The ontological insecurity generated by the inauguration of the atomic bomb, therefore profoundly shapes a sense of "being in the world" that works both collectively and individually, since nuclear necropolitics "has defining and lasting consequences [...] for biopolitics and the larger ecology of mind and planetary life that molds the formation of subjectivity" (xi). In this sense, Schwab expands existing discussions of nuclear politics by introducing a clear focus on the relationship between sociocultural experiences and subjective formations of psychic trauma.

Radioactive Ghosts draws on classical works within the field of nuclear criticism and critical theory, including the writings of Jacques Derrida, Achille Mbembe, Jonathan Schell, and Arundhati Roy. Schwab combines these insights with works on trauma citing Robert Jay Lifton as well as Nicolas Abraham and Maria Torok, to raise intriguing questions about the politics of the archive and the emergence of a haunted nuclear imaginary. In aiming to link these different strands of thinking comprehensively through the lens of psychoanalysis, Schwab's ambitious book develops a complex framework for approaching the nuclear imaginary with the help of exhaustive examples, ranging from activism to pop culture, to literature and personal experience. Schwab herself describes the book's design as "rhizomatic" with "feedback loops between chapters to revisit particular issues in light of new perspectives drawn from different, yet interrelated theoretical debates" (xv). However, her focus on the impact of the nuclear age on psychic life undeniably sets Schwab's book apart from other scholarship in the field.

Drawing on psychoanalysis, Schwab theorizes the role of the 'nuclear unconscious' for the formation of said 'nuclear subjectivities.' The concept of 'nuclear subjectivities' builds on the beginning of the nuclear age with the first detonation of the Manhattan Project inaugurating an "ontological, psychological and epistemological break" (xiv). By depicting the Manhattan Project as a moment of rupture, Schwab convincingly outlines that the nuclear age is marked by an ontological insecurity that alters human subjectivity and thereby transforms the human species itself (21). "Nuclearism," she writes, "marks the formation of subjectivity so pervasively that it presents a challenge to reconceptualize all notions of the subject and its environment, including psychoanalytic ones" (39). At the core of her theory of nuclear subjectivities is the concept of a traumatic nuclear unconscious. Comparing the traumatic events of the bombing of Hiroshima and Nagasaki by the US military in 1945 with the nuclear catastrophes of Chernobyl and Fukushima, Schwab identifies structural similarities of subjectivities formed after both nuclear war and nuclear accidents that "are marked by certain features that include a pervasive epistemology of deceit and denial, a fascination with the nuclear sublime, a devastating awareness of the psychic toxicity of living in a nuclear zone, and a haunting from the future" (162–163). In this sense, Schwab interrogates nuclear trauma and memory via the subject's psychic defenses, including fantasy, amnesia and disaster fatigue. She explains that:

> [i]n relation to the nuclear threat, familiar psychic defense mechanisms, such as splitting, doubling, dissociation, denial, moral inversion, deceit, psychic encryption, forgetting, and, in some cases, even traumatic amnesia, have become common conditions of human functioning in everyday life (xiii).

Schwab insists these psychic defense mechanisms, described through a wide array of examples, happen on an individual as well as on a collective level. The fact that the legacies of the Manhattan Project notable permeate from the individual to the collective and back to the individual again is an important aspect of her psycho-political approach and her interest in breaking down scales of trauma.

Scale is, inherently, a very pressing matter in Schwab's book. First, the nuclear challenges every notion of scale from the outset: from the atom, the tiniest element, to the magnitude of the effects of nuclear weapons into the vast cosmos and possibility into deep futures, the scale of nuclear violence challenges the boundaries of human imagination and experiences. It is exceedingly difficult to grasp the impact of radioactive material whose half-life goes far beyond the cognitive and conceptual capacities of most. As the nuclear not only requires but demands new modes of thinking across extreme scales, Schwab draws on Timothy Morton's *Hyperobjects* and, with a nod to Deleuze and Guattari, on 'the molecular' to insist that nuclear necropolitics operate on the level of macropolitics and micropolitics at the same time (2020, 214). This multiscalar approach leads Schwab to conclude that

> [t]he fact that we deal simultaneously with a monumental hyperobject and with molecular animacies allows us to understand why it is so hard to grasp the terrifying scope and scale of nuclear necropolitics, let alone tell its stories (215).

Nuclear threats in other words are not simply inconceivable because of their extreme scales but also difficult to challenge, because this inconceivability is also pervasive and ubiquitous—like being, death, or time itself.

Radioactive Ghosts challenges a common sense of temporality and, with its focus on nuclear haunting, reconceptualizes notions of linear time. Drawing on her previous work in *Haunting Legacies. Violent Histories and Transgenerational Trauma* (2010), Schwab compares transgenerational trauma caused by traditional war that originates in the past to nuclear injury, emphasizing the specificity of nuclear haunting as not only encompassing the past and the present, but also the future. Given that

radioactivity's overwhelming half-life extends human life/death into the deep future, the "slow violence" of past nuclear contamination, the ongoing danger of nuclear wars and catastrophes, as well as the fear of future annihilation, marks radioactivity as "being ontologically an "undead" materiality" (45) that creates a "double haunting from both the past and future" (79) with vast implications for the psychopolitical realities of individuals and collectives.

Schwab's analysis extends to specific forms of historical discrimination. In particular she examines the link between anti- nuclear resistance and the African American fight for civil rights. Drawing on Achille Mbembe's *Critique of Black Reason* (2017) as well as the works of Ngũgĩ wa Thiong'o, W.E.B. Du Bois, and Martin Luther King Jr. (an avid anti-nuclear activist in his own right), Schwab highlights the efforts of these thinkers to "trac[e] the roots of both racism and nuclearism back to colonialism and imperialism" (90) insisting on a 'critique of nuclear reason.' Schwab cites the attempts of Black thinkers to demonstrate the link between racist oppression and the nuclear military industrial complex via the notion of "economic warfare" (90) whereby excessive military budgets in the service of the nuclear arms race directly impact Black disenfranchisement through the elimination of social funds, programs, and services. The struggle against nuclear violence, she concludes, is therefore inseparable from the Civil Rights Movement's fight for social, economic, and racial justice (2020, 104). In other words, nuclear politics are subsumed with questions of race, class, and gender. Unpacking nuclear violence is therefore inherently linked to intersectional analyses.

Schwab intersectional analysis of the discriminatory system of nuclearism links the nuclear subject to wider formations of differential power, including climate change, colonialism, and reproductive health. Drawing on Karen Barad, Schwab insists on the materiality of haunting crucial to understanding the entanglements of nuclear politics with other (raced, classed, gendered) forms of violence, and emphasizes the interplay between nuclear power and structural injustice. For example, Schwab explains that the 'success' of the Manhattan Project was only made possible through the colonization and exploitation of indigenous lands and peoples, accentuating that nuclear mining and the production of nuclear weapons repeat colonial gestures of resource extraction and biopolitical violence. Stressing this continuity of nuclear colonialism, Schwab also highlights the link between nuclear politics and present fights against water injustice, such as the resistance movement at Standing Rock.

To Schwab unpacking nuclear violence further invariably exposes gendered fantasies of life and death that blur the boundaries between body

and bomb. In particular, Schwab addresses the relation between reproductive politics and gendered subjectivities in the nuclear age, concluding that "[t]he long-term and transgenerational effects of radioactive contamination on reproductive functions, of course, affect women disproportionately" (128). At the same time, nuclear contamination invokes what Schwab calls the "phantasm of the mutant body" (129), which anticipates a posthuman future via antinuclear discourses on motherhood. However, on the other end of the heterosexist spectrum gendered fantasies of the nuclear also put into focus a "male centered politics of reproduction" (118). Following Michel Carrouges's concept of the "bachelor machine" heralding the two first atomic bombs "as new babies" and revealing tacit fantasies of male self-generation "in competition with women's reproductive powers" (119), Schwab explains how the Manhattan Project can be seen as "the culmination of new technological weapons that support the myth of the triumph of masculine technology over nature and the feminine" and as "an almost orgiastic culmination of male fantasies of conquest" (120)—à propos *Oppenheimer*. Scholars of queer theory might find the focus on male vs female biology lacking, but Schwab's main point in highlighting these poles is ultimately aimed at critiquing sustained fantasies of *male* reproduction at the core of nuclear fetishization. Schwab demonstrates how gendered fantasies of technological birthing feed into ongoing reproductions of the nuclear sublime, as it drives the excessive militarization of the nuclear sector post 1945. At the crux of this apocalyptic imaginary, to Schwab, crucially lies a concocted "superior adaptability" (129) that circumvents women's reproductive advantage on one hand and uninhabitable toxic environments of radioactive contamination on the other.

Radioactive Ghosts develops this focus on trans-species imaginaries, situating contemporary nuclear politics within "the larger context of the molecular turn in the life sciences" (xiv). Building on Michelle Murphy's concept of chemical infrastructure and Mel Chen's concept of animacies, Schwab explains that the book is currently the only study "that has theorized this molecular turn in the formation of nuclear subjectivities" (xiv). Mobilizing literature and art on phantasms of mutations and metamorphosis, Schwab expands Marx's concept of "species being" and Robert J. Lifton's concept of the "species self," replacing them with the less anthropocentric concepts "transspecies being" and "transspecies self." By arguing that the nuclear danger goes far beyond humans alone, Schwab demonstrates "an awareness of the entanglement of species in relation to threats of extinction and the concomitant struggle for survival" (240). As a result, she pleads for a new ethics of care that includes other living species and transcends environmental speciesism.

Ultimately, willingly or not, *Radioactive Ghosts* invokes nuclear imaginaries and addresses key concerns of apocalyptic discourse: Staying true to the etymological meaning of apocalypse as a form of revelation, the book uncovers the many layers of injustice, violence, and repression invoked by the nuclear. While both apocalyptic and nuclear imaginaries invite a prefiguration of extinction, the apocalypse is commonly conceptualized as a spectacularly catastrophic event. *Radioactive Ghosts*, on the other hand, shows that ends of worlds can also be durational and slow. Schwab summarizes the apocalyptic outlook of the book as follows:

> the nuclear age is haunted by the specter of extinction, the challenge is to imagine extinction within its sociopolitical parameters without succumbing to the lures of the apocalypse [...]. Denying the specter of extinction, in other words, would be as detrimental to understanding the nuclear challenge of our time as embracing its phantasmatic lure. Only an irreducibly social conception of ontology can avoid this double trap (258–259).

In other words, while Schwab insists on acknowledging the political urgency of imagining extinction, she also challenges her readers to focus on new beginnings, on the power of story-telling, and on productive (and adaptive) practices of worlding. In this light, the book ultimately reads as a call for resistance—a determination for survival, collectivity, alliances and alternative ethics of care despite the ever-looming threat of extinction—eyes wide open but without falling into despair.

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