“NOT THE END”

ARTISTS ON AND AGAINST NUCLEAR CLOSURE

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ABSTRACT

Casualties of nuclear technologies are not immediate, and the populations that bear the most significant burden are too sparse to be noteworthy, especially in the case of uranium mining industries. Shaped by forms of settler colonialism – the US and Canada mine on Indigenous and First Nation reservations – effects of radioactive exposure produce slow, recursive forms of nuclear suffering as illness may take up to thirty years to manifest. This article zooms in on the case of uranium mining and the violence of the temporal lag between uranium exposure and the appearance of symptoms. It explores how this lag is critically interrogated by two contemporary artists that approach uranium mining histories as unresolved; as a series of situations whose unfolding goes on, thus going against the closure of narratives of uranium mining. Two artworks that critically engage with the slow temporality of uranium and its violent effects, and that this paper closely reads, are Bonnie Devine's drawing series *The Book of Radiance* (1999) and video *Rooster Rock, the Story of Serpent River* and Eve Andrée Laramée's installation *Halfway to Invisible* (2009). Both artists lay bare the temporal possibilities of turning our gaze away from obvious nuclear symbols, such as bombs and reactors, or what technology historian Gabrielle Hecht calls our *fetishes* of nuclear histories (*Being Nuclear. Africans and the Global Uranium Trade*), to rather engage with less obvious nuclear histories. Drawing on theoretical insights from recent scholarship in science and technology studies and art history around time, the paper emphasizes the affordances of contemporary art in redressing uranium mining as a slow and latent modality of the nuclear complex.

KEYWORDS

Nuclear extractivism; Science and technology; Slowness; Non-closure; Contemporary art.

Our fetishes keep us close to bombs and reactors and far from other places
where nuclearity gets made and unmade.
Gabrielle Hecht, *Being Nuclear*

What exactly is nuclearity, and who gets to define it? Where is nuclearity? Most importantly, what is the temporality of nuclearity, its duration? If nuclearity is the set of characteristics that make something nuclear – the geographical, historical, and sociopolitical parameters that qualify an activity, say an explosion, as of the nuclear order – then an atomic bomb or a nuclear reactor is almost universally considered nuclear. Science and technology historian Gabrielle Hecht,[1] who coined the term, proposes "nuclearity" in contrast to "radiation", highlighting how the physical presence of radiation does not always lead to the official designation of an operation as nuclear.[2] Uranium – the most important mineral for both military and civil nuclear energy, obtained through mining – is a prime example, as it was turned into a banal commodity through the transformation of the raw ore into yellowcake, subsequently traded internationally. Indeed, scientific narratives around uranium have succeeded in enabling the substance to largely bypass legal regulatory frameworks. As a result, both uranium mining histories and uranium's toxic effects have been obfuscated. A key factor in that process of obfuscation is the specific temporality of uranium: symptoms from exposure to the substance only become visible years later, complicating any connection between cause and effect. Uranium's toxicity, as a form of harm that is not spectacular, has thus received meager historical and mediatic attention; which in turn has allowed it to persist over time.[3]

In what follows, I explore how the violence of this temporal lag between toxic exposure and the appearance of symptoms is critically interrogated by two contemporary artists that approach uranium mining histories as unresolved; as a series of situations whose unfolding goes on. The violence done by the labor of uranium mining has not gone unnoticed by artists for some time now, in different geographical contexts and historical moments.[4] Bonnie Devine's

1
The colonial histories of mining, and especially of uranium mining and its relation to the wider nuclear culture of the Cold War, have until recently received scant scholarly attention in comparison to the libraries that have been written on almost all other aspects of the nuclear; Gabrielle Hecht's work has been significant for that shift in focus of nuclear histories.

2
Gabrielle Hecht, *Being Nuclear. Africans and the Global Uranium Trade*, Cambridge, MA 2012, 15.

3
Scholars have shown a similar dynamic for other forms of toxic chemicals, across various geographical contexts.

4
I offer an attempt to historicize artistic engagements with uranium mining in Kyveli Mavrokordopoulou, Irrésolutions nucléaires. L'art contemporain à l'aune de la 'nucléarité', in: *Les cahiers du musée national d'art moderne* 160, 2022, 77–89. For a similar approach in the

drawing series *The Book of Radiance* (1999) and video *Rooster Rock, the Story of Serpent River* and Eve Andrée Laramée's installation *Halfway to Invisible* (2009) directly respond to the slowness associated with the effects of uranium mining and its lingering, violent traces. Both artworks lay bare the temporal affordances of turning our gaze away from obvious nuclear symbols, or what Hecht calls our *fetishes* in the passage that opens the present essay, to rather engage with less obvious nuclear histories. Drawing on Hecht's conceptualization of the temporality of nuclearity, ultimately, I suggest that Devine's and Laramée's works put forward irresolution and non-closure as productive temporal modes to accommodate the slowness of uranium's toxicity. Before moving onto my understanding of slowness in relation to (nuclear) toxicity and contemporary art, I will unpack Hecht's emphasis on the role of time in the uneven distribution of nuclear toxicity.

Uranium mining has consistently been organized along racial lines, as it is colonial powers who mined on colonized and formerly colonized territories while employing communities in the mines: France in Niger; Russia in Kazakhstan; the United States, Canada, and Australia in Indigenous, First Nations, and Aboriginal lands. Unevenly distributed and shaped by factors of race and class, the environmental and health effects of uranium mining have thus also been unevenly felt. Hecht's work has underlined the importance of understanding the uneven geographical distribution of uranium extraction without, however, leaving behind its uneven temporal distribution. The *when* of nuclearity matters as well. Literary scholar Jessica Hurley has similarly argued for a temporal understanding of the violence of the nuclear age, locating the latter in the temporality of the infrastructural everyday as the site of nuclear apocalypse – from urban locations of civil defense, like atomic shelters, to uranium extractive sites.[5]

Focusing on intimate manifestations of nuclear violence, I follow Hecht's insight that the slow unfolding of lung disease among uranium miners has been essential to the undisrupted continuation of mining operations for the nuclear industry. Exposure to radon, the radioactive gas produced by uranium ores in the mines, takes ten to thirty years to instigate disease. "That's a long time to track people in a scientific study. It's also enough of a lag to generate doubt about the link between exposure and illness."[6] This temporal ellipsis between exposure and symptoms became itself an actor that obstructed the effect of uranium on the body; it became difficult to study workers and has thus produced harmful delays in setting standards and creating regulations to keep them safe.

field of literature, see the compelling work of literary scholar Jessica Hurley, especially her monograph *Infrastructures of Apocalypse. American Literature and the Nuclear Complex*, Minneapolis 2020.

5
Hurley, Infrastructures of Apocalypse, 9.

6
Hecht, Being Nuclear, 42.

Despite the centrality of uranium mining in the nuclear project it has been absent from political, academic, and cultural imaginings of the atomic age. In large part this is due to the inaccessibility and/or disorder of archives, especially since the latter have floated in an ambiguous status in between the public domain and private institutions.[7] Hecht's own difficulties accessing archives are repeatedly accounted for in her research, and the same goes for other recent scholarship on the topic.[8] Social imaginings of the atomic age have likewise generally centered on the immediate disruption symbolized by atomic explosions at the expense of their longer aftermath or underpinning mining activities, as has been argued by different scholars recently. Identifying this absence or lack, contemporary artists have become critically engaged with the issue, initiating a starting point for dialogue. Artistic imaginings of the atomic age, or at least *certain* artistic imaginings, have decidedly contributed to the decentering of the primal event the bomb embodies, focusing instead on the more mundane aspects of life in a nuclearized world. Indeed, one might argue that it is in great part *due* to inaccessibility and lack of archiving that artists have engaged with the topic. Drawing on theoretical insights from recent scholarship in science and technology studies and art history around time, the paper emphasizes the affordances of contemporary art in redressing uranium mining as a slow and latent modality of the nuclear complex.

Considering the delayed and discreet pace of the manifestation of uranium's toxicity emerges from an understanding of time as open-ended on both a material and a semiotic level. This framework very much draws on scholarship around "slowness" and related temporal notions as they have become keywords in the humanities in recent years. My approach builds on recent points of contact from two fields that rarely get to meet – art history and science and technology studies (STS) – which have, certainly in different ways, both engaged with notions of temporal openness and non-closure. Recent scholarship in STS has been concerned with the slow and open-ended temporality of the toxic, highlighting the inherent uncertainty brought about by the slowness, if not endlessness, of the lag between exposure to toxicity of chemicals and symptoms experienced in the body. The list is long, but suffice it for now to cite the important work of Michelle Murphy on toxic latency, as "the wait between chemical exposure and symptom. To be latent is to be dormant, a potential not yet manifest". Chloe Ahmann's

7
For instance, environmental and health reports and photographic documentation of mining activities and infrastructures were, and still are in some cases, held by the mining companies. This means they fall under the purview of the private domain and access is not always guaranteed.

8
Along with Hecht, communication scholar Peter C. van Wyck, who has written about uranium mining in Canada, recounts his own experiences in which permissions to access materials in the Canadian National Archives were not granted. Peter C. van Wyck, *The Highway of the Atom*, Montreal 2010.

"meantime" as an important temporal aspect of living with the slow violence of incremental pollution in which she stresses the intermittent aspect of one's experience of toxicity. Ruby de Vos's recent work on the "toxic meanwhile" as a temporal framework allows for a temporary bracketing of toxicity whether on a collective sociopolitical or personal mental level, and which is largely supported by toxicity's invisible nature.[9] What unites such readings, in their divergences, is the underlying assumption of the temporal violence inherent in contemporary experiences of toxicity, whether nuclear or otherwise.

In art history and media studies, art historian Christine Ross and cinema and media arts scholar Lutz Koepnick have discussed slowness through media and technological experimentation. Ross unsettles the linearity of both historical and art historical narratives, as well as their seemingly immaculate conclusions on what they document. Operating in what she calls the temporal turn in contemporary art, she undertakes a comprehensive study tracking repetition, slowness, and open-endedness in contemporary moving-image practices engaged with historiography. Interminability, endless loops, lack of narrative resolution, slow motion, and slow dissolves are some of the modes contemporary artists are employing to put off the closing of the modern past as "past".[10] Koepnick situates himself against discourses of slowness that probe nostalgic or escapist longings for a preindustrial past that have proliferated in the last years. He rather defines a different ethos of slowness that animates contemporary lens-based and multimedia practices, notably through technological experimentation, especially slow-motion photography. Yet, interestingly enough, the slowness Koepnick theorizes is not in opposition to speed or acceleration. Rather than orienting viewers to the "presumed pleasures of a preindustrial past", he casts slowness as an artistic strategy that invites us to "gaze firmly at and into the present's velocity and temporal compression".[11]

While I am indebted to all these bodies of work that suggest slowness as an effective strategy to experience the present's intensification, my focus in this essay are experiences of slowness that exist under an industrialized present not in opposition to but rather

9
Michelle Murphy, Chemical Infrastructures of the St Clair River, in: Soraya Boudia and Natalie Jas (eds.), *Toxicants, Health and Regulation since 1945*, Abingdon/New York 2015, 103–115; Ruby de Vos, *Living with Toxicity. Disruptive Temporalities in Art and Culture*, PhD diss., University of Groningen, 2021; Chloe Ahmann, 'It's Exhausting to Create an Event Out of Nothing'. Slow Violence and the Manipulation of Time, in: *Cultural Anthropology* 33/1, 2018, 142–171. It's important to note that Rob Nixon's "slow violence", "a violence that occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space", to which a lot of this work is indebted, has become a keyword across the environmental humanities. Rob Nixon, *Slow Violence and the Environmentalism of the Poor*, Cambridge, MA 2011, 3.

10
Christine Ross, *The Past Is the Present; It's the Future Too. The Temporal Turn in Contemporary Art*, London 2012, 287.

11
Lutz Koepnick, *On Slowness. Toward an Aesthetic of the Contemporary*, New York 2014, 72.

as a co-constitutive part of its operatory model. Pointedly, anthropologist of science Joseph Masco has defined such forms of slowness, between environmental events and the recognition of their long-term repercussions as "the major psychosocial achievement of the industrial age".[12] Seen through this prism, an analysis of the violently slow pace of the bodily manifestation of nuclearity requires careful consideration of its material workings. If slowness is by definition always relegated to the background, then we need to attune to its details and its material specificities. In order to think about the material slowness of nuclear exposure, I move through the theoretical insights offered by recent art historical discourses on time and temporality, layering them with the necessary material considerations on time offered by the work of contemporary STS scholars on toxic exposure. Taking a cue from Ross's "plea to go with irresolution" – an invitation to think against the closure of historical narrative – I want to probe what such an endeavor, to remain in the unsolvable, might look like if explored through the material endurance of radiation.[13] What for Devine and Laramée becomes a striving against the closure of histories of uranium mining, even when mining activities have resumed.

I. Unfinished Business: Bonnie Devine

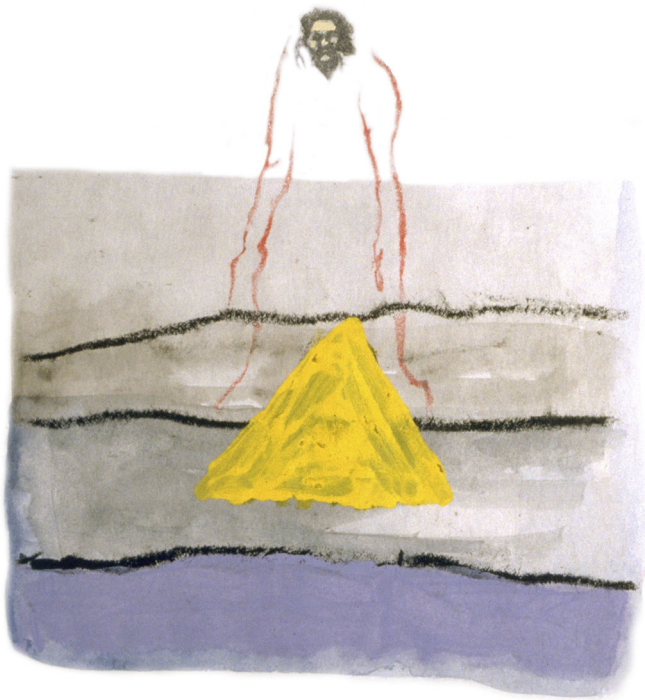
In 1999, Bonnie Devine (b. 1952), an Anishinaabe/Ojibwe artist, made a series of drawings reflecting on the history of uranium mining in the Serpent River First Nation. The exploitation of the land started in 1953, with the discovery of uranium ores, and supposedly ended in 1996, when extractive activities ceased. Yet after the closure of the mines, nearly two hundred million tons of radioactive mill tailings continued to contaminate the Serpent River watershed, causing massive but mostly undocumented deaths of plant, animal, and human life. Part of a trilogy around the discovery of uranium mining on the Canadian shield,[14] this series of drawings is called *The Book of Radiance* [Fig. 1, Fig. 2 and Fig. 3]. It shows, with disarming candor, the natural surroundings where the Serpent River First Nation lives. Underneath each drawing, made with watercolor and tar, a small caption ascribes a narrative edge to the image, reminiscent of the genre of a visual essay. Most of the captions are enigmatic, however, throwing suspicion on what it is we are looking

12
Joseph Masco, The Age of Fallout, in: *History of the Present* 5/2, 2015, 137–168, here 153.

13
Here Ross discusses the film installation *Klatssasin* (2007) by Stan Douglas. This recombinant work is essentially nonlinear; it defies the limitations of a traditional film format by having no real beginning or end. Referencing Akira Kurosawa's legendary film *Rashomon* (1950), in which a plot is described in several contradictory ways, in *Klatsassin* a murder unfolds through flashbacks, time shifts, ambiguous cuts, and multiple perspectives.

14
The Book of Radiance and *The Book of Transformation* constitute parts one and two of a trilogy; the third part of the trilogy is called *The Book of Radiation*.

[Fig. 1]
Bonnie Devine, Book of Transformation, 1999, drawing, mixed media, paper, 8.5 × 11 in.



[Fig. 2]
Bonnie Devine, Book of Transformation, 1999, drawing, mixed media, paper, 8.5 × 11 in.

[Fig. 3]
Bonnie Devine, Book of Transformation, 1999, drawing, mixed media, paper, 8.5 × 11 in.

at. Amid the trees, forests, waterways, and Manitous,[15] a recurring element disturbs the apparent purity: a stark, yellow, hilly triangle. Part of the quasi-totality of the drawings, it recalls the fluorescent gleam of yellowcake, an artificially refined uranium ore that is often used as an intermediate step in the production of nuclear weapons. The powdery radiant matter is a structural element, at once of the drawing and of the landscape, but its ubiquity is not limited to the natural surroundings. One of the drawings poetically evokes the continuity between territory and body through a faint layering of a map over a human figure. Drawn on a yellow background, the caption simply reads: "poisoned". This radiance, in Devine's world, refers not only to radiation but also to the radiant light of a prophetic vision. This foreseeing acquires its full potential in a further iteration of the drawings, where Devine opted for a different artistic medium and subsequently developed a fully fledged narrative that unlocks the enigmatic coupling of image and caption in *The Book of Radiance*.

In collaboration with artist Rebecca Garrett, Devine switched from the static medium of drawing to the fluid medium of moving images with the video *Rooster Rock, the Story of Serpent River* (2002) [Fig. 4 and Fig. 5].[16] While the drawings pass in front of our eyes at a slow pace, we hear members of the community, notably the artist's uncle, narrating Anishinaabe environmental knowledge and how it endures, but also foresees the nuclear industry's catastrophic forces. The Saulteaux First Nations Canadian curator, artist, and writer, Robert Houle has underscored the centrality of oral traditions for the Anishinaabe and frames Devine's practice within conceptual and cultural inheritances.[17] The infamous clicking of a Geiger counter resonates in the background as a nonvisual reminder of the persistence of radiation. The sonic stability of the Geiger counter enters into sharp contrast with the multilayered temporalities evoked in the voice-over.

As different stories and chants converge in the voices of the narrators, the past, present, and future of the Serpent River First

15
Among certain Amerindian peoples, the Manitou is a supernatural power embodied in foreign persons or mysterious and unusual objects. Devine considers "uranium as an animate being, an arcane life form, not yet accounted for by present day biology or physics, in that it possesses qualities of self-generation and evolutionary development. I believe this is what the ancient ones, the Anishinaabek, would call a Manitou." Bonnie Devine, correspondence with the author, April 8, 2022.

16
The choice of artistic medium here is important, yet we shouldn't overlook the drawings too quickly as "static". In an essay on Devine, Robert Houle inscribes the artist in a longer lineage of drawing, notably in connection to the work of another Ojibwe artist, Norval Morrisseau (1932–2007), founder of the Woodland School. Houle traces a connection between Morrisseau and the Grand Medicine Society's use of pictography as a mnemonic device. Robert Houle, Dibaajimowin / Storytelling, in: Bonnie Devine, Tom Hill, Robert Houle, and Diane Purgen, *Stories from the Shield. Bonnie Devine*, Woodland Cultural Centre, Brantford, ON 2004, 18–28, here 21, 22. Some serigraphs by Morrisseau are indeed close to Devine's work in terms of their form, as for instance in the color composition in *Nature's Balance* (1976).

17
Ibid.

[Fig. 4]
Bonnie Devine, Rooster Rock, the Story of Serpent River, 2002, video stills, Betacam, 32 min., 16:34 © Vtape and the artist.

[Fig. 5]
Bonnie Devine, Rooster Rock, the Story of Serpent River, 2002, video stills, Betacam, 32 min., 12:12 © Vtape and the artist.

Nation come together in the nuclearized landscape. The voices are composed, the pace of the video is steady. Yet the narration is not linear; it has no clear beginning or end. In contrast to the drawing series, the extractive violence performed on the landscape becomes ever clearer as Devine introduces the vision of her uncle, Art Meawasige, in which he describes having seen a yellow powder a few years prior to the geological discovery of the uranium ores. The nonlinearity of the narrative muddles past and future temporalities, bringing us back to a time when the landscape was untouched by such pollution and to a time, also, when people didn't *have* to reckon with it. In providing access to a prenuclear past in Anishinaabe cosmology, the work figures how nuclearity weaves into familiar idioms for Devine, only by disrupting them and changing the course of history. In other words, it figures how nuclearity has the power to disrupt the order of (certain) worlds – to take up Hecht's lines that open this article – and how this disruption, in its intermingling with traditional Indigenous knowledge, also occurs through the specific temporality of radiation.[18]

As Masco has noted, "The first thing that nuclear technologies explode are experiences of time by simultaneously enabling both the absolute end of time and the exponential proliferation of a toxic future."[19] This endlessly producing toxic future is translated in Devine's work through the absence of narrative linearity, which takes a particularly decisive turn toward the end of the video. The piece ends abruptly, without offering any sense of closure or resolution. In lieu of the traditional "The End" in cinematographic and video works, Devine concludes with a bold "NOT THE END". This open-ended ending demands to be fathomed in its full potential.

Devine, in an almost manifesto gesture, opts to "go with irresolution" (to follow Ross) and *not* ascribe a clear endpoint in the history of uranium in the territory of Serpent River First Nation. Against a framework in which the closing of the mine in 1996 would signify the end of harms associated with mining, she posits the temporal openness of this story because, quite simply, Serpent River is still contaminated territory, and the Anishinaabe people still suffer from the symptoms of radiation-induced illness. *Rooster Rock, the Story of Serpent River* shows us that despite the material slowness through which radiation becomes palpable as illness, the radioactive mill tailings will be actively harmful for longer than the material's half-life. And it is this material lingering endurance of radioactive toxicity that demands creative frameworks able to accommodate its constantly evolving temporal workings.

18
This connects to some extent, although unrelated to nuclear histories, with Mark Rifkin's insightful conceptualization of temporal multiplicity and Indigenous sovereignty beyond conventional settler-colonial binaries. See: Mark Rifkin, *Beyond Settler Time. Temporal Sovereignty and Indigenous Self-Determination*, Durham, NC/London 2017.

19
Joseph Masco, *The Nuclear Borderlands. The Manhattan Project in Post-Cold War Mexico*, Princeton, NJ 2006, 12.

[Fig. 6]
Bonnie Devine, Reclamation Project, 1995, Lynde Shores Conservation Area, Whitby, Ontario, photograph by the artist © The artist.

The malleability of time informs Devine's broader oeuvre. In her earlier land art installation *Reclamation Project* (1995) [Fig. 6], she deployed her work in various locations throughout southern Ontario. Adhering to the artist's hallmark simplicity, this site-specific piece was a simple stretch of turf laid onto different spots for, as she put it, just the time necessary to take a picture.[20] This ephemeral installation – that is, the antipode of slowness – was a direct comment on the killing of an Anishinaabe protester, Dudley George, during a police action against Camp Ipperwash in September 1995. At first sight, *Reclamation Project* might appear straightforwardly concerned with space. It is about, after all, possessing space: through violence, in the case of enduring settlement of present-day Ontario, or through activism, via the temporary occupation of the land against territorial expropriation that followed World War II.

As anthropologist Patrick Wolfe pointedly noted, "Whatever settlers may say – and they generally have a lot to say – the primary motive for genocide is not race (or religion, ethnicity, grade of civilization, etc.) but access to territory."[21] The potential resources or broader settler projects gained through access are precisely targeted by the ephemerality of Devine's gesture in *Reclamation Project*. Just like in *Rooster Rock, the Story of Serpent River*, possessing land might be the primary act of settler colonialism, but it is importantly also a form of temporal possession. And indeed, it is the undisrupted continuity and endurance of settler land possession, and the longevity of its toxic material aftermaths that these pieces are subtly targeting. The open-ended conclusion of *Rooster Rock, the Story of Serpent River* precisely points to the endlessness of any attempt to address forms of nuclear-colonial toxicity; it can only be an ongoing battle, unfinished business much like the endless and ongoing processes of decolonization. In short, *Rooster Rock, the Story of Serpent River* dismisses any presumption that nuclearity is behind us and stages interminability as a political imperative.

II. Uranium, Activism, and the Temporal Logic of (Un)spectacular Accidents

Devine's video and drawings should be understood as products of their time: the 1980s and 1990s were a moment when uranium mining became a central stake in the global Indigenous rights movement. Before turning to Laramée and the temporalities of uranium mining in New Mexico, it is worth taking a look at certain moments and people of the global anti-uranium movement, as they illuminate

20
I am deriving this, as well as the following information on the work, from the reading of *Reclamation Project* offered in James Nisbet, *Second Site*, Princeton, NJ 2020, 41–42.

21
Patrick Wolfe, Settler Colonialism and the Elimination of the Native, in: *Journal of Genocide Research* 8/4, 2006, 387–409.

the temporal logics of what constitutes a nuclear accident in the first place.

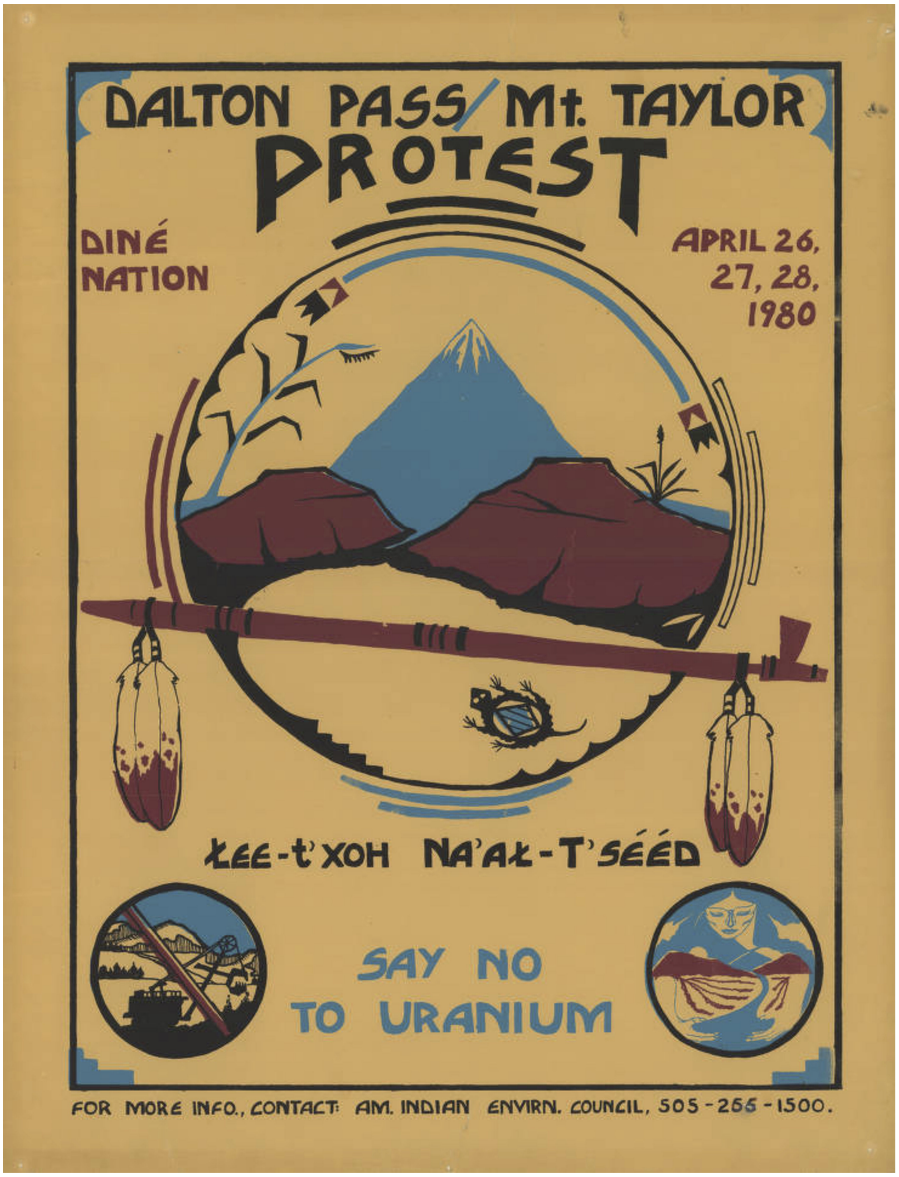
A turning point in the movement against uranium was the 1992 World Uranium Hearing, an international conference, the first of its kind, that took place in Salzburg and gathered speakers from all continents, including Indigenous activists and scientists who testified to the health and environmental problems of uranium mining. But starting in the 1970s, the work of people like Winona LaDuke, member of the Ojibwe tribe and longtime Native American rights activist, had already been crucial in opening a transnational dialogue on the effects of uranium mining. LaDuke visited the uranium mines in Elliot Lake, Ontario, in the 1980s, contributing to the establishment of a transnational dialogue across Canada and the United States in Indigenous struggles against uranium.[22] In the mid-1980s, LaDuke also coauthored a particularly informative essay openly connecting colonial land dispossession and nuclear operations on Native lands, under the umbrella term, "radioactive colonialism".[23] Remarkably, uranium mining operations were covering much bigger parts of land than other resource extraction activities (for instance low-sulfur coal and reserves of oil and natural gas) in all of the western United States, more than one half of *all* US uranium deposits laying under reservations. On a map illustrating the bigger picture of the toxic soup generated by resource extraction on Native lands illustrating the article, uranium's broad territorial sweep distinctly stands out. To think with Wolfe again, there could not have been uranium mining without access to territory, and it is the opposition to this continuous occupation that informed the lexicon and imagery of the global Indigenous anti-uranium movement [Fig. 7].

Although Hecht has noted that activist mobilization against uranium mining remained on the fringes of mainstream anti-nuclear action,[24] people like LaDuke subtly connected the two as they maintained ties with different political formations. For example, appearing on a radio show produced by Los Angeles performance group Sisters of Survival (SOS) in 1980, LaDuke stated her support and action for the feminist movement against the atomic bomb, which back then was very much tied to the anti-nuclear missile mobilizations taking place in Europe – a movement then clearly

22
A trace of these visits can be seen in Magnus Isaacson's political documentary *Uranium* (1990), where one can see scenes of LaDuke conversing with the local population about the effects of the mining industry and sometimes, interestingly, referring to the factor of time as an insurmountable obstacle for Indigenous anti-nuclear struggles.

23
Ward Churchill and Winona LaDuke, Native America. The Political Economy of Radioactive Colonialism, in: *Insurgent Sociologist* 13/3, 1986, 51–78.

24
Hecht, Being Nuclear, 289. She makes this case for movements in Canada and the United States, but sets the Australian case apart.



[Fig. 7]
Poster from protest against the uranium industry on Navajo land on April, 26, 27 and 28, 1980 © Center for Southwest Research, University Libraries, University of New Mexico.

removed from Indigenous struggles against uranium extraction.[25] Although the focus of the radio show was on nuclear disarmament as a critical stake for women's political organizing, LaDuke's broader activist practice exemplified her far-encompassing anti-nuclear ethos, which did not set the two struggles apart. Paying attention to such activist works today is crucial, especially for their political formulations of which kinds of nuclear events make the headlines and which do not.

In her essay on radioactive colonialism, LaDuke refers to an "enormous accident" that occurred in July 1979 in Church Rock, New Mexico, at the United Nuclear uranium mill.[26] The adjacent mill tailings dam collapsed, releasing more than one hundred million gallons of highly radioactive water into the Rio Puerco. The crack should have been anticipated, since "band aid" fixes had unsuccessfully attempted to fix smaller cracks in the dam in the months leading up to the accident. The impact was immediate: primary water sources for Navajo people were contaminated, and innumerable wild animals and livestock ingested radioactive water and died. The Southwest Research and Information Center deemed the spill the "uranium industry's Three Mile Island".[27] But in fact the Church Rock spill was more severe than Three Mile Island, which in nuclear histories is considered the first substantial civil accident, an eerie premonition of what was to come in 1986 with the Chernobyl disaster.

Yet the Church Rock spill remains an under-documented and poorly mediatized occurrence. Historian Traci Brynne Voyles has convincingly shown how inadequately, and at times unprofessionally, the spill was covered, for instance with mistakes in place names in media outlets outside of New Mexico.[28] Another key factor in its media coverage was the lethargic time frame of the event's dissemination. Notably, the Environmental Protection Agency's tardy recognition of the mining company's responsibility contributed to information on Church Rock being slowly produced and distributed. To this day, the spill figures marginally, if at all, in lists of major nuclear accidents. LaDuke's lexicon of an "enormous disaster", then, is important, as it firmly places Church Rock on the global podium of nuclear accidents. This choice of words is also important since Church Rock did not yield any spectacular pictures, making its visual archive anemic, too. It is the rhythm of knowledge produc-

25
Helene Rosenbluth, *You Can't Kill the Spirit. Women and the Anti-Nuclear Movement*, Los Angeles: End of Rainbow Productions, 1983, 30 min. The author accessed the audio file in the archive of the International Institute of Social History, Amsterdam.

26
Churchill and LaDuke, Native America, 86.

27
Traci Brynne Voyles, *Wastelanding. Legacies of Uranium Mining in Navajo Country*, Minneapolis 2015, 168.

28
Ibid., 167.

tion around nuclear exposure and the glacially paced recognition of myriad undocumented uranium mining accidents in New Mexico that underpins the artistic practice of US artist Eve Andrée Laramée (b. 1956).

III. Epistemic Slowness: Eve Andrée Laramée

Laramée often begins her interviews by citing the Church Rock accident. Her practice of the past twenty years is linked to a specific political and historical context – namely the New Mexico region, and more generally the desert Southwest of the United States, which is linked to the nuclear age on multiple planes. Where Devine figures the effects of the atom at the level of the ecosystem and the cosmos, Laramée zooms in on the body and the cell, prompting an examination of Masco's invitation "to examine the effects of the bomb not only at the level of the nation-state but also at the level of the local ecosystem, the organism, and, ultimately, the cell".[29] In 2009 she created an installation entitled *Halfway to Invisible* that traced the history of uranium mining in the Four Corners region to the microscopic level, examining the cellular mutations of people who worked for, or were affected by, the presence of the mining industry [Fig. 8 and Fig. 9]. The title refers both to the invisibility of radioactivity and to the half-life of radioactive materials. The work was commissioned by the Center for Disease Control at Emory University and shown at the, now defunct, university gallery on the occasion of the bicentennial of Charles Darwin's birth, which in part explains its specific focus on biological evolution.

The artist has described the installation as a tool to visualize information "in a non-linear time-based mode".[30] First and foremost, the sense of nonlinearity was curated through interlacing a motley array of elements. The video component, *Evolution/Mutation*,[31] was a montage of images drawn from geology and biology that faded into each other at a quick pace. Aesthetically recalling the psychedelic color palette, vividly abstract reds, purples, and greens disintegrated into one another. What these images represented were scalar juxtapositions: on the one hand, cancerous cells mutating because of contact with radon, and on the other, close-ups of geological formations such as volcanos and the thermal springs of

29
Joseph Masco, Mutant Ecologies. Radioactive Life in Post-Cold War New Mexico, in: *Cultural Anthropology* 19/4, 2004, 517–550, here 521.

30
Eve Andrée Laramée, Tracking Our Atomic Legacy. Now We Are All Sons of Bitches, in: *WEAD. Woman Eco Artists Dialog* 5, 2012 (June 2, 2022).

31
A full version of the video is available online at http://vimeo.com/64467515 (June 2, 2022).

[Fig. 8]
Eve Andrée Laramée, Halfway to Invisible, 2009, installation view, motion-activated stainless steel laboratory cages, light boxes with images and text, video projection, video sculpture, photographs, archive of documents, at the Emory University Gallery (now defunct)

[Fig. 9]
Eve Andrée Laramée, Halfway to Invisible, 2009, installation view, motion-activated stainless steel laboratory cages, light boxes with images and text, video projection, video sculpture, photographs, archive of documents, at the Emory University Gallery (now defunct)

Yellowstone National Park, where extremophiles abide.[32] The visual similarities between the two were striking. Next to the video, a metallic kinetic sculpture was activated upon the visitor's approach. Reminiscent of animal cages in laboratory settings, it could be interpreted as a direct reference to the intense culture of animal testing in nuclear weapons laboratories.[33] To the side, a modest laboratory bench exhibited a variety of scientific scholarship and imagery on uranium mining, a Geiger counter, and a photograph of a portable radon gas detection kit. Around the gallery, no less than sixty little lightboxes containing images of genome maps adorned the walls, yet the lighting was dim, and visitors struggled to read precisely what they depicted. Upon closer inspection, one started to notice words overlaid on the scientific images, among them "doubt", "indefinite", "liable", "expose", and "protect". The aesthetic lexicon of the installation pointed to uncertainty as a key condition engineering epistemic slowness – the trick of intentionally producing scientific knowledge around the biological dangers of radiation exposure *slowly*, so as to facilitate uninterrupted and unregulated mining activities.

Challenging prevailing notions of scientific authority, the installation conveyed the sense that these different sites where science is mediated – images, papers, allusions to the laboratory setting – are not to be taken at face value. Rather, the arrangement of all these components suggested that gaining access to scientific knowledge around the effects of toxic exposure cannot be unmediated. Uncertainty saturated the space. This uncertainty was not accidental but mirrored that of the scientific community itself, especially in the initial years of the uranium boom in the early 1950s in the Four Corners region [Fig. 10]. The uncertainty that plagued studies of occupational disease linked to radon and radiation produced "delays in setting standards, in creating regulations, in testing", just as it lowered operating costs and upped profits.[34] Uncertainty, and the epistemic slowness it generated, was instrumentalized by the industry. The immediate and future-oriented time span of industrial progress reigned over the long-term uncertainties of exposure. The installation orchestrated yet another temporal friction: whereas the worth attributed to the land by Indigenous epistemologies derives from centuries of "historical, religious and geographical meaning", its industrial worth treats the land as instantly

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Extremophiles are resilient microorganisms that can survive in extreme environments, for example in very high temperatures. They may also be radiation resistant and can even proliferate in the effluent from nuclear reactors. Currently, research is being conducted to assess whether extremophiles could be used in the cleanup of contaminated sites.

33
The cages are referred to as "animal cages" in the exhibition checklist. For more on how experiments on human and nonhuman bodies helped produce a substantive body of knowledge about the bomb, see Hugh Gusterson, *Nuclear Rites. A Weapons Laboratory at the End of the Cold War*, Berkeley, CA/Los Angeles/London 1996, esp. chapter 5, Bodies and Machines, 101–130.

34
Hecht, Being Nuclear, 42, 204.

[Fig. 10]
Image part of the image archive, in: Eve Andrée Laramée, Halfway to Invisible, 2009, signs point the way to different mine sites in the Ambrosia Lake uranium district, date unknown

pollutable.[35] Self-legitimizing access to territory of settlers, recalling Devine, contrasts with longer-standing relations to land. In fact, the devaluation of longer temporalities was inherent to the nuclear project at large.[36] By exposing these conflicting, and ultimately irreconcilable, temporal registers, *Halfway to Invisible* staged the inherent tensions between the time spans of profit-seeking prospectors, of lives spent in the mines, and of centuries of Indigenous land epistemologies.

The way the installation staged uncertainty was in continuity with Laramée's previous work and its challenging of the hegemonic nature of scientific knowledge. *Apparatus for the Distillation of Vague Intuitions* (1994), for example, is a vast glass sculptural installation simulating a chemical, or rather alchemical, laboratory [Fig. 11]. An intricate interweaving of glass vessels, tubes, and wires, it has no seeming structural logic, reminiscent of the nonlinearity the artist would implement fifteen years later in *Halfway to Invisible*. Upon closer inspection of the work, one realizes that the glass is handblown and thus does not conform to standards of scientific instruments (in fact, the glass was salvaged leftovers from Los Alamos National Laboratory); below the table lie upended jars, spilled liquids, and rotting leaves. On some glass surfaces, terms such as "dither", "hesitate", or "mouthfuls" are inscribed. In short, this is clearly the site of an unsuccessful scientific experiment, where chance, subjectivity (as opposed to scientific objectivity), and embodiment ruled.[37] By refusing to depict the aseptic white cube of the modern laboratory, *Apparatus for the Distillation of Vague Intuitions* valorizes premodern forms of knowing and exhibits *how* science is made rather than the instantaneous glorification of scientific discoveries. A process, not a petrified moment in time, is at stake in this laboratory of failure.[38]

What I encapsulate as the epistemic slowness of the installations discussed in this section similarly points to something in process. *Halfway to Invisible* did not simply unleash scientific evidence on the effects of radiation exposure; its role was not merely to stage scientific information. The artist stated as much when she said that the work was not seeking to propose a pat answer, solution, or

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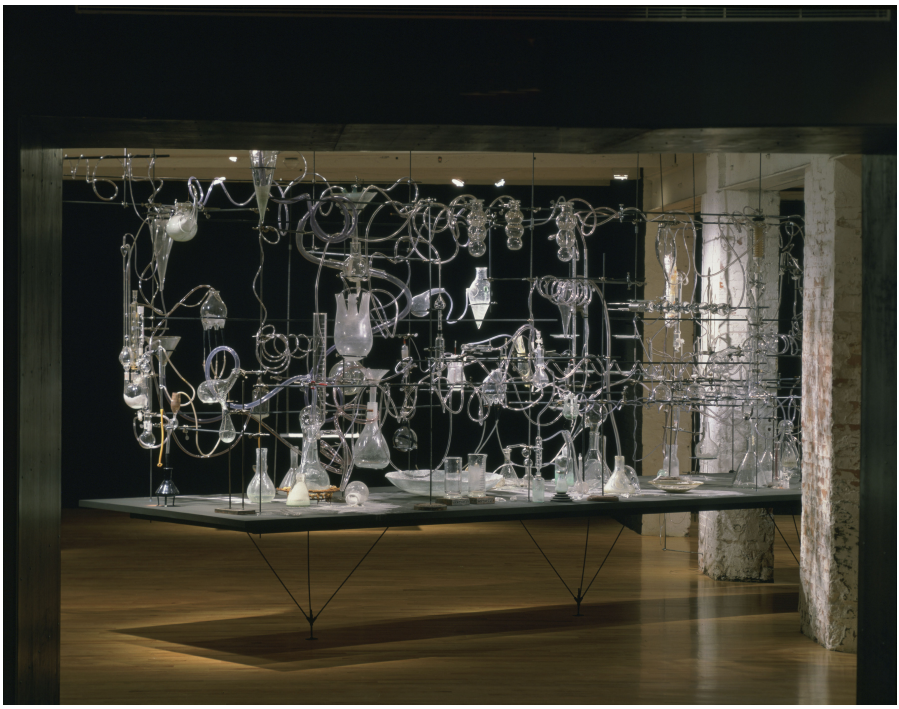
Voyles, Wastelanding, 154.

36
Erin La Cour, Katja Kwastek, Lutz Koepnick, and Kevin Hamilton, The Aesthetics and Politics of Slowness. A Conversation, in: *ASAP Journal* 4/3, 2018, 467–483.

37
Different instruments included in the installation – flasks, measuring liquids, cylindrical bottles, and Burette clamps – directly reference chemistry labs. The choice of chemistry is not anodyne given the low seat it occupies in the deeply hierarchized landscape of scientific knowledge (as compared, for instance, to physics), which has been especially picked up by female historians of science, like Isabelle Stengers and Bernadette Bensaude-Vincent.

38
I elaborate further on the installation's processual aspect in: Kyveli Mavrokordopoulou, The Function and Dysfunction of Science. Artists Inside and Outside the Laboratory, in: *Espace Art Actuel* 126, 2020, 18–27.



[Fig. 11]
Eve Andrée Laramée, Apparatus for the Distillation of Vague Intuitions, 1994, steel, hand-blown and laboratory glass etched with text, copper, salt, flowers, installation view, Mass-MoCA, 2001 © The artist.

conclusion.[39] Rather, it pointed to the mechanisms that define these same effects, and more precisely to the historical rhythms through which those effects come into public visibility (or not, as Hecht's nuclearity shows us). To do so, Laramée flipped the script to some extent by subtly relocating the process of knowledge production from the scientific community to the Indigenous communities who actually worked in the mines. This shift in focus raises a further question about nuclearity's production: what other realms of knowledge does epistemic slowness interfere with?

Before concluding, let us situate the installation from a different perspective, at the confluence of science, cultural knowledge, and aesthetics.[40] Amid the terms used to cover up the lightboxes, one could read various words underscoring scientific authority as enumerated before, for instance "indefinite" and "resolve". Some of the lightboxes, however, superimposed different languages and types of information: in one, the Navajo word *ah-chanh* (protect) overlaid a human genome map and a traditional Navajo basket design. In another, the term *blih-he-neh* (warning) masked a cellular representation [Fig. 12]. The choice to interlace Native American and Western words and signs testified to the fact that the violence exerted against the Navajo miners by the uranium mining industry was not only bodily, but also cultural and geographical; the techniques, rites, social uses, and social life spaces of these populations were intoxicated just as their bodies were.

The choice to operate in the realm of language is no accident on Laramée's behalf. The Navajo have unique obstacles to face in recognizing radiation-induced illness as, for example, the Navajo language does not contain the necessary terms to describe certain novel symptoms. As some historians have put it: "In contrast to the anglophone populations, Navajos had to develop a nuclear lexicon."[41] Lexical and symbolic interventions into the images invite us to consider the temporal sites when knowledge was produced in contrast to the epistemic slowness that prohibited the production and circulation of knowledge about radiological dangers. Against epistemic slowness, Laramée posits a nonlinear and open-ended organization of competing temporal registers.

39
Laramée in the exhibition leaflet, n.p.

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This last insight is very much inspired by the recent work of art historian Amanda Boetzkes around the linking of Inuit knowledge and scientific knowledge on glacier melt. See, for instance, Amanda Boetzkes, How to See a Glacier in a Climate Landscape, in: *Weber. The Contemporary West* 34/1, 2018, 123–137. This is a special issue on "The Anthropocene".

41
Barbara Johnston, Susan Dawson, and Gary Madsen, Uranium Mining and Milling. Navajo Experiences in the American Southwest, in: Laura Nader (ed.), *The Energy Reader*, Malden, MA 2010, 132–146, here 140.

[Fig. 12]
Eve Andrée Laramée, Halfway to Invisible, 2009, lightbox details superimposing Navajo language transliteration, genome map, and traditional basket design © The artist.

IV. Toward Open-Endedness

Heather Davis and Zoe Todd, the authors of "On the Importance of a Date, or, Decolonizing the Anthropocene", remind us that "In gesturing to Indigenous suffering in North America we have great responsibilities to also attend to the time-scapes and realities of those people and communities whose ancestors were violently dispossessed through Transatlantic slave trade."[42] The two artists examined in this essay pay close attention to the ways uranium mining industries have manipulated time in such a way as to disturb long-standing relations to land. Despite the material slowness of radiation, such disturbances have led to profound disruptions by interfering with Indigenous cultural knowledge – language for Laramée, and origin myths for Devine. The reorganization of competing epistemic temporalities in *Halfway to Invisible* acknowledges the importance of attending to time frames beyond the immediacy of profit and the strategic slowness of science. The example of *Rooster Rock, the Story of Serpent River* shows how an intentionally open ending demands the ongoing-ness of political struggles against the ongoing effects of nuclear toxicity on the Serpent River community. Both works address the material slowness of radiation by seeking frameworks that might accommodate, and importantly account for, its elusiveness by cultivating incompletion as an aesthetic and political strategy. Yet neither Devine nor Laramée are propelled forward by a teleological drive towards resolution. To think of time through open-endedness is to resist narratives that seek to establish closure and linearity in nuclear histories, whether in places like Canada's Serpent River or the US Southwest.

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42
Heather Davis and Zoe Todd, On the Importance of a Date, or Decolonizing the Anthropocene, in: *ACME. An International Journal for Critical Geographies* 16/4, 2017, 761–780, here 772–773.

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