OFFERINGS

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The Highway of the Atom: Recollections Along a Route

Citation[1]

This project began for me in an encounter with a documentary film by the Toronto film-maker, Peter Blow. His film, *The Village of Widows,* is an extraordinary tale of the Sahtu Dene of Great Bear Lake. The Dene—who have resided in the region for three or four thousand years—were involved in the mining and transportation of first radium, then uranium ores from a mine-site on Great Bear Lake to Waterways, Alberta. As a result of this labour, the Dene have suffered the loss of many of their men and children. Cancer.

The uranium mined from Dene land had been used in the development of the bomb, and the massacre of Japanese civilians—as they were told, to end the war.[2] In addition to seeking explanation, compensation and acknowledgment from the Canadian government, the Dene organized a most extraordinary expedition of their own. They went to Japan; they went there to apologize to the Japanese.

The entire apparatus of implication, the mining company, the crown corporation, the processing facilities in Port Hope, the secret laboratory at University of Montréal, the interjurisdictional industrial-military complex (the British, the Canadians, and the Americans), the entire route through which those materials passed, infinitely beyond the sphere of the knowledge, influence, and at the time, concern of the Dene, was bypassed. They went to the end of the circuit to convey their apologies for having been involved, to acknowledge their responsibility. What had not been registered as traumatic in the first instance, was in a way even less so in the second.[3] Unfathomable. *Every other is every bit other* (Derrida). Their expedition was not traumatic, but ethical.

I started to think about the rest of the route. The ore was transported over a well-worn route for over twenty-five years. How are we to understand the history and the memory of this time through the route?

This route came to have a proper name: the Highway of the Atom.[4]

So, after having spent some number of years writing about the *other* end of the process—the placelessness of spent nuclear materials—I've begun to think about this place in the North of Canada, this piece of marginal history—a piece of history, it seems to me, much in need of *rubbing against the grain.*

This work is an action at a distance; I am fumbling down the Highway of the Atom, looking for an art of memory. What follows then are some fragments, pieces, reflections on a place and a time from which I am a bewildered stranger.

Two Figures That Work Very Differently

> *Between the clear and the obscure, there are little transitions.*
>
> —Halbwachs, *Leibniz*

1. Aground, in a shallow bay near the village of Deline, home to the Dene uranium workers, is the rusting hulk of the Merchant Vessel *Radium Gilbert*—a ship that had plied the waters of Great Bear Lake with uranium ore since 1946. The Dene would like it not to be there. As a ruin, it is an unintended monument to what had been a secret history. They believe it to be a point-source of radioactive contamination, and they don't like that it's there (SENES 1994:Appendix).

This is not a commemorative gesture; it is the threat of a repetition, a traumatic inducement to a memory not quite recalled. "It ties an irrefutable past ... to a future that cannot be anticipated ... "[5]

2. Fastened to the wall in the mine dry (the change room) near the central mine adit at Port Radium was a bottle containing a curious artefact. It contained sand that had been fused into glass in the infernal instant of the Trinity detonation of July 1945 in the New Mexican desert (Jenkins 1999:46). The absolute repose of the inorganic. I don't know how it got there.

This *was* a commemorative gesture; it turned a wartime assemblage of complicity, exploitation, innovation and production into an historical and productive sequence, a mute benediction of the beginning by the end.

Birth Order

In the strange alchemy of decay, radium is called the daughter of uranium.

In the strange mythology of the Greeks, Cleo, the Muse of History, is called the daughter of Mnemosyne, goddess of Memory (and imagination).

Vision

> "Eldorado, they call you," I thought as I peered through the window of the plane for one last look back upon this place of difficult toil. "That name implies the vision of desire. This Eldorado, for all its harsh surroundings, is well named, for it is from here, by this hard work, that radium which will bring relief for so many sufferers, goes out to an anxious world. (Macdonald 1938:7–11, 44, 45)

So wrote a journalist upon the occasion of her visit to Port Radium in 1938.

The mine at Port Radium was opened by Eldorado Gold Mines Limited in 1932, and produced the first commercial radium one year later.[6] Staked by Gilbert LaBine two years earlier, it was the site of a considerable pitchblende find.[7] You could smell it, apparently.

It is said that prospectors would use photographic film to find pitchblende by its trace.[8] One must always relay the invisible into the order of visibility.

The Stamp

The ghost of Innis looms not far from all of this, nor, for that matter, from the area in question—he spent the summer of 1924 paddling on the Mackenzie River.

Anyway, perhaps the claim is obvious. We have here a case study in the production of a twentieth century staple.[9]

New staples produced periods of crisis, he said, and left painful adjustments in the wake. Coastal fisheries, furs, timber, placer gold, base metals, pulp and paper.

Indeed, but there's more. "Each staple," he wrote, "in its turn left its stamp" (1950:5). They left their stamp according to the kind of staple they were; in the move from trade proper (as with fur), to industry (as with mineral extraction). In the first instance, trade, there is commodity-production and commercial activity. In the second, there are, as Mel Watkins observed, "two critical and traumatic adjustments": the imposition of wage economy and the yielding up of land-ownership (1977:85–88). This is only part of the story.

Staples have always accorded to trade routes, and these routes are well-worn paths, many of them. That is, both physically and epistemologically: as McLuhan put it, "the trade-routes of the mind" were extensions of "the trade-routes of the external world" (cited in Cavell 1999:352) A nice line. He had lots of them—but it but it still begs the question of whose mind, whose trade-route, and whose external world.

In any case, the production of uranium in the North of Canada has very much left its stamp. But the stamp cannot be grasped merely as an historical or topographic ques-

tion.[10] The stamp is certainly material. But it is also narrative and traumatic, social and epidemiological (the Dene can attest to this, as can the miners), as well as political and historiographic, and memorial and discursive.

And each of these modes is subject to the kind of decay that is particular to it. Nuclear, temporal, semiotic, narrative, death ...

The stamp has marked the North, post-marked the North c/o the Dene, the miners, the folks along the Highway, and us.[11]

Alibi

Almost at the very conclusion of *Civilization and its Discontents,* Freud made the link between individual development, *vis à vis* neurosis, and the development of systems of civilization. This wasn't exactly the first time, but here it is a link he "could hardly evade," for it followed smoothly from the connection between phylogeny and ontogeny.[12]

> If the development of civilization has such far-reaching similarity to the development of the individual and if it employs the same methods, may we not be justified in reaching the diagnosis that, under the influence of cultural urges, some civilizations, or some epochs of civilization—*possibly the whole of mankind*—have become 'neurotic'? (Freud 1985a:338)

In any case, it is here that psychoanalysis steps out of the analytic configuration, but it does so with a caution. In a sense, it is a purely formal or logical caution against the cavalier movement of analogies from their proper domain to another. Here Freud notes that individual neuroses of necessity presuppose a normalcy in the environment from which that neurosis may be distinguished. Figure and ground. Yet no such presumption could be made once the category of concern became a community, or a civilization. These are too unwieldy. In other words, "no such background could exist; it would have to be found elsewhere" (338).

This *elsewhere* is the thing.[13] It is and has been generally available, in generic and exceedingly flexible form, as "human nature." And as we have seen again and again from eugenics to National Socialism, to racisms of all kinds and more generally to various politics of identity, human nature is not so much a *concept* as it is a fiat for political endeavour. Or better, it is an alibi in the precise sense of a place which is full and one which is empty, linked by a relation of negative identity ("I am not where you think I am; I am where you think I am not"). A present emptiness, or an absent plenitude.[14]

The ground is more than a metaphor.

Trauma / Magic

Trauma finds itself in a state of indecision precisely with respect to the kind of association of ideas that founds it, to the mode of *its* derivation. On one hand it is to situate the psychical trauma as a prolongation or continuation of the medicosurgical theory of the physical trauma. And on the other hand, it is to transpose more or less the elements of the later—the physical trauma—into a different sphere (Laplanche 1976:131). "That of an extension through *continuity,* an imperceptible transition to an adjacent field; and that of a transposition through *similarity* into a field that is different but structured as analogous" (131).

Here, rather than taking the retroactive explanatory force of trauma into an unknown region, I will make a slight shift into an adjacent field.

Structurally speaking, sympathetic magic is founded on the same distinction between contiguity and similarity. Frazer, in the *Golden Bough* (which is then echoed by Freud in *Totem and Taboo*), explains that the first mode is that like produces like, that the effect resembles the cause—imitative, or homeopathic magic.

And the second, contagious magic, is that "things which have once been in contact with each other continue to act on each other at a distance after the physical contact has been severed" (Frazer 1951:12).

These accord to two principles, he said, the Law of Similarity, and the Law of Contact or Contagion.[15] Frazer illustrates the Law of Similarity through the "Eskimo" prohibition against boys playing "cat's cradle" on the grounds that doing so as a child would result in a similar, though catastrophic event as an adult—one might become tangled in a harpoon-line whilst hunting "whales."[16]

The Law of Contact or Contagion is found in a multitude of afterbirth and umbilical rites, the ongoing protection of childhood teeth from misadventure and contamination, and the care one must take with bodily impressions left on the earth; (the Pythagoreans' habit of smoothing the bed clothes immediately upon rising in the morning.) Footprints, it seems, are particularly vulnerable sites through which one's enemies may inflict harm. Which is to say: *you are vulnerable to your route.*

The stamp, its imprint, is homeopathic, discoverable only in ruins. But the action of the stamp, which persists even in the staple's absence, is contagious.[17]

Material

As a question of history and memory, the Highway of the Atom is singular. Not a history symbolically deposited into a site—the figure of the monument. It is a kind of history that *literally*—which is to say, *materially*—persists in the present. In this sense there is no need to blast history into the present ... it's already there. Rather the problem appears to be one of a representation—which is to say, a mode of transmission or

communicativity. Or perhaps *modes,* because we speak here not only of an archive (dispersed as it may be) but also of material scattered along a route. Leakage.

The material presents itself as a kind of confluence between a nuclear concept of half-life—how long before it's half gone?—and a biological concept of LD_{50}—how much before half are dead? As Deleuze and Guattari say of the machine, I will say of these materials: we do not first ask of them what they mean, we first ask only what it is that they do. How long, and how much—these are the questions proper to nuclear materials.

And what is the danger of this material, this leakage? The material's danger, although not visible, is not even on the order of the visible as such.[18] It always requires a mediation in order to be disclosed. That is, a relay into a semiotic regime: a Geiger counter to render it sonorous or audible; a story to recall it, to place it; a narrative to render it comprehensible within a sequence of events; or a body or tissue to be transformed by the absolute invisibility of alpha and beta particles, of gamma radiation. In other words, nothing renders it visible, it can only relay into the order of the visible via the production of signs (signals, sounds, symptoms).

There is material leakage all along the sides of the Highway, and as well on the vessels and barges that used to traverse it.[19] At Fort Smith and Bell Rock, at Fort McMurray, at Hay River and Fort Norman, and at Cache Island.[20] But also further downstream at Wrigley and at the Bennett and Franklin landings on the Great Bear River, at Fort Franklin, at the Sawmill Bay airfield (just south of the mine), at the mine site itself, and in Great Bear Lake where Eldorado dumped something on the order of 1.7 million tons of mine tailings.

The Highway of the Atom

This much I know.

The Highway is something on the order of 2500 kilometres. It begins, or ends—depending on how one looks at it—on Great Bear Lake, Northwest Territories, perched just at the Arctic Circle.

Great Bear Lake is vast. Shore to shore, you could travel over 300 kilometres. The Eastern shore, just below where the tree-line cuts across the glacial body of the lake, carved into barely fathomable depths in the late Pleistocene, at the end of McTavish Arm, buttressed in granite by the very western edge of the Precambrian Shield—lies Port Radium.

At the other end, at the very other end, is Waterways, Alberta, now known as Fort McMurray. The "end of steel," as it was called, the end of the railway; another stamp, another route. And in-between is, well, the Highway of the Atom.

In one sense the route is fairly simple. At least I could give you instructions and you would probably find your way.

When you reach the end of steel, you'll be in Waterways. Put your boat in the Athabasca River, then head downstream, just head for the ocean.

At Lake Athabasca, find the Slave River.[21] There's a long portage at Fort Fitzgerald. When you get to Great Slave Lake, at the far western arm look for the "River of Disappointment,"—as Alexander MacKenzie called it in 1789 upon discovering it led only to the Beaufort, and *not* the Pacific.

After you pass Fort Norman, follow the Great Bear River upstream into Great Bear Lake. About half way up, there's another portage around the St. Charles rapids. When you come onto the Lake you'll be just a few kilometres south of Fort Franklin, you'll see the Radium Gilbert. Then just go northeast for about 300 kilometres, right across the Lake, and you're there. That's it.[22]

Port Radium, formerly Great Bear, then Cameron's Point, Echo Bay, and (briefly) Radium City. And depending on when we are looking at it, it is a radium mine, a uranium mine, a silver mine, or a ghost town. Now, today, it is really a ghost town—the monument reads, in part: "It is not possible to count the number of people who have called Port Radium home over the fifty years that mining has taken place ... " (Jenkins 2000:End leaf). It's just not possible ...

The route though, the route also spreads out—again, depending on how you look at it, or when—to touch Ottawa, and Port Hope Ontario (where, in a retrofitted seed plant, under the guidance of one of Pierre Curie's students, the first radium was refined by Eldorado Gold Mines Limited in 1933), the Department of Munitions and Supplies research laboratory at University of Montréal[23], the Manhattan Engineering District (otherwise known as the Manhattan Project, which included three main operations: Los Alamos NM, Hanford WA, and Oak Ridge TN), the Trinity Site in New Mexico, the heavy water plant at Chalk River, the Union Miniere mine in the Katanga region of the Belgian Congo, the Bikini Islands, the Nevada Test Site, and, of course, Japan.

The Route

In following a route, one must take care. One must avoid ending up in "the crowded cemetery of history": a piece of advice from Maurice Halbwachs (1980: 52). History, he said, may leave us as passengers on a boat.

> As the riverbanks pass by, everything he sees is neatly fitted into the total landscape. But suppose he loses himself in thought ... Later on he will be able to remember where he traveled but few details of the landscape ... he *will be able to trace his route on a map* ... [but] he has not really been in contact with the country through which he passed (1980:53; emphasis added).

We suffer, here as elsewhere, from too few routes into the past. From the point of view

of this route—this Highway of the Atom—what is the power of the past, apart from our efforts to reconstruct it? Is it, as Peirce put it of memory, *a gentle compulsiveness?* It doesn't seem very gentle.

The image that comes to my mind is oddly musical—a kind of contortion of Bruce Chatwin's realization that "music is a kind of memory bank for finding one's way about the world,"—musical phrase as a "kind of map reference" (1987:108). The route, showing my own European roots, might be thought of as contrapuntal; that is, *punctus contra punctum,* which we could move from the *note against note* of polyphony, to moment against moment, or point against moment. In other words, it is not simply a horizontal movement, the spread of the route, an extension, the lay of the land. There is, simultaneously, a vertical development—bodies of all kinds—in a presupposition that is both generative and controlling.

The route is also a thickness, a palimpsest. *Really, there's no point in making a new portage when there's one already there.* What then is the art of memory proper to the route?

The Stones Are Speaking Now

Wrote the great Viennese archaeologist of the symptom, in 1896:

> Imagine that an explorer comes in his travels to a region of which but little is known and that there his interest is aroused by ruins showing remains of walls, fragments of pillars and of tablets with obliterated and illegible inscriptions.
>
> He may content himself with inspecting what lies there on the surface and with questioning the people who live nearby, perhaps semi-barbaric natives, about what tradition tells of the history and meaning of these monumental remains, and taking notes of their statements—and then go away.
>
> But he may proceed differently; he may have come equipped with picks, shovels and spades, and may press the inhabitants into service and arm them with these tools, make an onslaught on the ruins, clear away that rubbish and, starting from the visible remains, may bring to light what is buried.
>
> If his work is crowned with success, the discoveries explain themselves; the ruined walls are part of the ramparts of a palace or treasure house, from the pillars a temple can be reconstructed, the many inscriptions, which by good luck may be bilingual, reveal an alphabet and a language, and when deciphered and translated may yield undreamed-of information about the events of the past, to commemorate which these monuments were built. *Saxa loquuntur (*Freud 1959a:184–185*).*

The stones speak.

Lieux de mémoire: A Mnemonics of Catastrophe

If the stones are speaking, it is not history that is listening. Freud's memory arts—the mnemonics of the unconscious—the ramparts of the palace, are, as Nora puts it, like

> moments of history torn away from the movement of history, then returned; no longer quite life, not yet death, like shells on the shore when the sea of living memory has receded (1989:12).

When the sea of living memory has receded ... here Nora is not talking to us; he is talking to Maurice Halbwachs. In the midst of his explorations of the workings of collective memory, Halbwachs give the image of sea waves breaking on a rocky shore.

As the tide rises, the rocks are immersed in the advancing sea. But with its retreat, what remains of the sea's presence are only "miniature lakes nestled amidst the rocky formations." In Halbwachs's analogy [and in Nora's], the advancing sea *is* the tide of living memory. Its waves pulse forward, bearing toward the future the turbulent presence of the past. With the ebbing of the tide, only pools of recollection are left behind. In them the past remains alive, but with a diminished presence.[24]

The rocks here are the containers. The places of memory. It is a history—functioning not as the *el Dorado* of memory, put perhaps its *el Nino*—that *both* makes these places necessary, and threatens to make them disappear irretrievably.

The term—lieux de mémoire—has no english equivalent, says Nora. But in the note appended to the English translation of "Between Memory and History," he gives us a clue. It derives, he says, from the work of Frances Yates. This makes such extraordinary sense.

In *The Art of Memory,* Yates resurrects the Greek traditions of mnemotechnica—the *ars memorativa*—she tracks them through time. Pausing occasionally for a harmonic leap of brilliance, she shows how these arts (right from the start, in their probably apocryphal beginnings in a catastrophic banquet survived by the poet Simonides) were based on the elaborate articulation of a dual repertoire: imaginary memory places (loci), and images. Properly trained the mnemonist could navigate the lush, well-lit, comfortably spaced architectural places of memory to retrieve the images therein consigned. The memory arts were based on this elaborate system of double displacement.[25]

In this very telling note, Nora suggests that perhaps the memory places—stones and Highways included—must be understood as part of a larger mnemonics—no longer quite life, not yet death. His project begins with a rubric of places, and works outwards to memory, the *pools of recollection.*

The route—the Highway—is also an art of memory in reverse—that is, finding a place for the memory, and finding a memory for the place. The loci are not only imaginary, they are not only *mental constructions,* they really are places.[26] I don't know the extent of memory of the Highway, but I do know that the Highway seems to be consuming its own travelers, its witnesses.

The Highway then is caught in a secret and deferred action. It is opaque to memory and oblique to history. Perhaps not yet a lieu de mémoire—not for me, and not for you, not yet. It is the site of a slow and dispersed catastrophe, but one that unfolds backwards in time.

It is a case study in the analytics of the accident.[27]

Montréal, January 2002

Notes

1. The problem: On one hand, much of the contemporary literature of disaster research tends to fall under the disciplinary domains of geography and sociology. For geography, the traditional model for the disaster has been the relationship between the hazard, and the spatial disruption that ensues in the wake of the disastrous "event." This area of disaster research tends to foster a conception of the disaster as the agency of the natural visited upon vulnerable human society (e.g., Fritz, Burton, Wolfenstein).

For sociology the question of the disaster has been a shifting theoretical region. In the last several decades the understanding of disaster has begun to move from the expression of a hostile external agency (i.e., the natural hazard, nature as cause)—with its operational metaphors lifted appropriately from discourses of war—to the disaster itself as the expression of a social vulnerability (i.e., the social as cause; and here the cyclone that slams into the Bay of Bengal is not caused by a confluence of atmospheric pressure vectors, but rather, it is these factors that make manifest, briefly though profoundly, the existing social and economic inequalities that place populations at risk to begin with, to a more or less hybrid arrangement where the disaster is understood itself as the expression of uncertainty—with respect to both nature and the social, e.g., Porfiriev, Dombrowsky, Gilbert).

On the other hand, in the last decade or so a reworking of Freudian trauma theory and an acute preoccupation with memory have become considerable features of theoretical and practical interest within the humanities generally. Trauma is seen both as a way to understand the limits of historical representation—with the Holocaust as model or cipher (e.g., Caruth, Felman)—and as a language with which to speak of the social and memory in the wake of disaster (e.g., van der Kolk, Caruth, Laub, Leys, Erikson).

With few exceptions (e.g., Hewitt, Erikson), the very promising intersections between the social science work on disaster, and the humanities work on trauma and memory, remain unexplored. And in any case, the dominant social understanding of the disaster remains precisely (and stubbornly) within the precinct of the concept of hazard, and simultaneously, within the instrumental grasp of techno-scientific and governmental / organizational frameworks (e.g., the U.N. International Decade for Natural Disaster Reduction, International Red Cross). My work attempts to engage debates within the broad constellation of these concerns.

2. Not long after, the prospect that the uranium atom was fissionable became much more than a prospect. At this point there were only a handful of sources of fissionable uranium in the world. The Colorado Flats, Belgian Congo, Port Radium, and to some extent, Sweden. The British and the French were both attempting to secure uranium from the Congo, and

early in 1942, Gilbert LaBine was summoned to Ottawa by C.D. Howe, then minister of Munitions and Supply, and asked to enter into a contract to supply uranium for war research. (See: Groom 1962:123–137). By the Fall of 1942 there was an order for 350 tons, deliverable to the American government, and before this order could be fulfilled, another order for 500 tons. In addition, 1200 tons of Congolese ore turned up in a Staten Island warehouse. All of this ore was to converge on Port Hope for processing.

The name of the company was changed to Eldorado Mining and Refining Limited. By early in 1943 the mine began to produce. At the Quebec Conference in August of 1943, Roosevelt, Churchill and Mackenzie King, acknowledging the threat of Germany's work on the bomb (they had Czechoslovakian uranium, control of a heavy water plant in Norway, and the scientific expertise) worked out the conditions for an Anglo-American-Canadian cooperative venture (123–137). On January 28, 1944 the bomb development project required that all aspects of production and research came under federal control—Eldorado Mining and Refining Limited became a Crown company, owned in its entirety by the Canadian Government. And in June 1944, the Combined Development Trust was created "to handle the procurement of fissionable elements not within the territorial limits on the contracting powers" (Alperovitz 1995:161).

Until the bombs were dropped on Hiroshima and Nagasaki in August 1945, virtually all of this was carried out in secret. Workers at the mine site were apparently unaware of the purpose of the ore, or at least this is the claim one finds most frequently. But as with secrets generally—that is, contents presumed larger than their forms—there are leaks.

3. See Laplanche 1976:41–43.

4. And as far as I can tell this name comes from a Northern Transportation Company Limited film of the same name that was produced in the 1960s, by Crawley Films of Ottawa.

5. This is the problem. Fear. And trembling. Writes Derrida: "We tremble in that strange repetition that ties an irrefutable past (a shock has been felt, a traumatism has already affected us) to a future that cannot be anticipated ... I tremble at what exceeds my seeing and my knowing ... a secret always makes you tremble" (Derrida 1995:53–54).

6. The history of mining for radioactive materials is one of reversals. An interesting feature of radium mining from pitchblende is that the waste product tends to be dross containing a high level of uranium. At the time the mine was producing radium, uranium was not a particularly valuable commodity. This had been a bit of a pattern, this flipping between which is the sum, and which is the reminder. Pitchblende had long been sought for its association with metallic silver. For example, in Czechoslovakia, the silver was taken, the pitchblende was dumped. In the middle of the nineteenth century, uranium compounds became valued in the ceramic industry (for pigments in porcelain, glass, tiles, enamel)—accordingly, pitchblende was sought for uranium, and old silver mine dumps were re-mined for uranium. Just before the turn of the century, pitchblende itself became a glow-in-the-dark novelty item; a parlour game. (Oddly, pitchblende gives no natural phosphorescence. It may be that the pitchblende in question contained impurities of zinc sulphide which could have become phosphorescent from the radioactive elements of the ore.) And it was at this time that Henri Becquerel made his discovery of radium, the Curies did their work, and the pan-curative powers of Radium became known. The Radium Girls, painters of watch faces and dials, mark the limit of the Curies work. The Port Radium mine continued production through the 1930s, the global price fell considerably, but demand increased little. As war began, manpower and equipment became

scarce, and world markets shut down, the mine became unprofitable, and in July 1940, closed.

7. And with it, a large body of silver.

8. See Spence 1989. The principal material to be mined was radium, already a mineral darling on global markets. In its heyday radium fetched over $180,000 per gram. Staggering. The LaBine mine was to be the richest source of radium on the planet. Prior to this find, there had been a small supply of radium from mines in Czechoslovakia, then around 1912 a find in the Colorado Flats bringing the price down to $125,000 per gram, and then a much larger find in the Belgian Congo, the Union Miniere du Haut Katanga, bringing the price down to $70,000 per gram. This mine held a virtual monopoly on radium until the mid-1930's. The world needed radium. It was ambrosia to health.

Radium is used in treating ringworm, psoriasis, acne, warts, neuralgia, etc. Radium affects the enlarged thymus . . . and the thyroid gland, or goiter in adults. Radium can be used to cause the menopause to be prompt and not distressing and to influence the action of the pituitary gland (Eldorado 1938).

A necessary component of industrial processes: Industrial radium is used principally in luminous paint and in photographing the internal structure of metal parts . . . all the radium in the world could hardly begin to do the job (Eldorado 1938). Note too the fascinating history of the Radium Girls. "It was a little strange, Fryer said, that when she blew her nose, her handkerchief glowed in the dark. But everyone knew the stuff was harmless. The women even painted their nails and their teeth to surprise their boyfriends when the lights went out" (Neuzil and Kovarik 1996).

A tonic for research: Laboratory experiments are continuously revealing exciting possibilities in other industrial uses, especially in working silk and glass, in canning foods and in stimulating plant growth (Eldorado 1938).

Every 500 tons of ore from the mine would produce one gram of radium. But the 500 tons of ore would be hand-cobbled into a concentrate of ten tons before it was sent down the Highway—at an annual rate of two tons a day. And as to why the ore would be treated at Port Hope and not at the mine site, the answer is that it takes seven tons of chemicals to treat one ton of concentrate. It was cheaper to ship the ore to the chemicals.

9. Concentration on the production of staples for export to more highly industrialized areas in Europe and later in the United States has broad implications for the Canadian economic, political, and social structure (Innis 1950:5).

10. Nor can the staple be understood in terms of a dialectic between a resource on the one hand (natural or otherwise), and the development of a productive (institutional) capacity on the other (staple-pull vs. staple-push, if you like). It is more complex, and more diffuse than this.

11. See Sexty 2000. "The issuance of stamps for the first half of the period studied (1898–1948) reflected the staple theory of Canadian economic history. Innis ... argued that economic history could be understood in terms of the dominance of a succession of staples such as fish, fur, timber, wheat, and minerals being produced and traded for manufactured goods mainly from Europe ... It is interesting to note that the first Canadian stamp in 1851 featured a beaver, the main fur export at the time. The Three Pence Beaver was the first stamp issued by any of Canada's founding colonies in 1851 ... Stamp topics reflecting staple goods were prominent through to about 1948 ... " (340). See also McNally 1981:35–63; McNally 1986:161–169; Robin 1969:3–15; Matthew 1999.

12. Freud makes a similar observation—though here a conjecture ("assumption") rather than a "diagnosis"—two years earlier in *The Future of an Illusion* (1985b).

13. Perhaps we see here Freud's conflicted scientism—he knew very well where the elsewhere could be found. But nonetheless he maintained an optimism that "one day someone will venture to embark upon a pathology of cultural communities." Although I won't explore it here, I would point out that he also issues a paradoxical caution which says that even for the reason just stated it would not be possible to move from the individual to collective, such knowledge as might be had through the errant analogy could not be used because no one would have the authority to "impose such a therapy upon the group" (1985a:338). In other words, there is an interesting element here in the form of a *first of all, it can't be done*, and *besides, it won't work*. Alibi.

14. Quips Barthes: "it is enough that [the] signifier has two sides for it always to have an 'elsewhere' at its disposal" (1973:123). See "Myth Today," where he makes the leap into the spatial dimensions of the alibi.

15. "Charms based on the Law of Similarity may be called Homeopathic or Imitative Magic. Charms based on the Law of Contact or Contagion may be called Contagious Magic" (Frazer 1951:13).

16. Frazer 1951:23. In this instance we have something that appears to be a taboo, but Frazer assimilates taboo as a negative magic; the rules of which are simply founded on the same misapplication of the association of ideas (22). Freud does not concur on this point. See Freud 1946.

17. The material in question, then, I take as an oddly empirical confirmation of the Law of Contact or Contagion. That is, it is indexical. The principle of teratogenesis—from the Greek, *teras*, portent, marvel.

18. This is a feature that is critical to *all thought* about ecological and nuclear threats.

19. The vessels used on the Highway are also part of the material leakage—they are its monuments, it's ruins. The Merchant Vessel Radium line: the Radium King, the Radium Queen, the Radium Lad, Radium Express, and of course the Radium Gilbert ... and so on. The rest of the list: Cruiser, Prince, Gilbert, Charles, Scout, Yellowknife, Franklin, Dew, Prospector, Trader and Miner. And the Barges—towed or pushed, according to conditions—the wooden barges of the 1930s and 1940s (most of which are now gone, salvaged for fire wood and building materials, and the steel barges which followed.

20. Some time in the 1940s—no one can quite remember when—a uranium barge struck a rock just downstream from Fort Providence ... the barge and its cargo were left there until after freeze up, when someone brought a sled team out from Providence and moved the bags of ore onto Cache Island.

21. Mind the portage at Fort Fitzgerald, there's four sets of rapids, so it's a long one; nearly thirty kilometres. These days it goes all the way through to Bell Rock, but in the 1930s, before the landslide at Fort Smith that erased the landing site, it was about twenty-three kilometres.

22. The route is here reconstructed from a number of sources, including Bothwell 1984; Eldorado Files, National Archive of Canada; Jenkins 1999; SENES 1994.

23. Opened in September 1942. British scientists, together with others who had escaped from France to England, worked on a design for a heavy water pile (an alternative to the graphite type being developed in the States.

24. See Hutton 1993:73.

25. The central repetitive analogy of memory in antiquity was that of a seal and wax. I am aware of its occurrence in Quintilian, Cicero, the Ad Herennium, Augustine, and, of course, Freud.

See Aristotle 1957; Augustine 1912; Cicero, Rackham, and Sutton 1959; Cicero and Caplan 1954; Quintilian and Butler 1959; and Freud 1959b.

26. See Chatwin 1987:279.

27. "Axiomatic, deterministic systems have lost their consistency and revealed an inherent defect. But it is not really a defect: it is a property of the system, something that belongs to it as a system. The Accident is not an exception or a sickness of our political regimes; nor is it a correctable defect of our civilization: it is the natural consequence of our science, our politics and our morality. The accident is part of our idea of progress as Zeus's concupiscence and Indra's drunkenness and gluttony were respectively part of the Greek world and of Vedic culture. The difference lies in the fact that Indra could be distracted with a sacrifice of *soma*, but the Accident is incorruptible and unpredictable ... It now promises total and accidental extinction without distinguishing between the righteous man and the sinner. The accident has become a paradox of necessity: it possesses the fatality of necessity, and at the same time the indetermination of freedom." (Paz 1974:112)

References

Alperovitz, Gar. 1995. *The decision to use the atomic bomb and the architecture of an American myth*. New York: Knopf.

Aristotle. 1957. On memory and recollection. In *On the soul. Parva naturalia. On breath*. With an English translation by W.S. Hett. The Loeb Classical Library, Cambridge: Harvard University Press, 289–313.

Augustine, St. 1912. *Confessions*, Books IX–XIII. The Loeb Classical Library, No. 27. Translated by William Watts. Cambridge: Harvard University Press.

Barthes, Roland. 1973. Myth today. In *Mythologies*. Trans. A. Lavers. London: Paladin, 109–159.

Benjamin, Walter. 1968. *Illuminations: Essays and reflections*. Trans. H. Zohn. New York: Schocken Books.

———. 1968. Theses on the philosophy of history. In *Illuminations: Essays and reflections*. Trans. H. Zohn. New York: Schocken Books, 253–264.

Blondin, George. 1990. *When the world was new: Stories of the Sahtú Dene*. Yellowknife: Outcrop.

Blow, Peter. 1998. *Village of widows*. [52 min., video]. Toronto: Lindum Films.

Bothwell, Robert. 1984. *Eldorado: Canada's national uranium company*. Toronto: University of Toronto Press.

———. 1988. *Nucleus: The history of Atomic Energy of Canada limited*. Toronto: University of Toronto Press.

Burton, Ian, Kates, Robert W., and White, Gibert F. 1978. *The Environment as hazard*. New York: Oxford University Press.

Caruth, Cathy. 1991. *Unclaimed experience: Trauma and the possibility of History.* Yale French Studies, no. 79, 17–37.

Cavell, Richard. 1999. McLuhan and spatial communication. *Western Journal of Communication,* vol. 63, no. 3: 348–363.

Chatwin, Bruce. 1987. *The songlines.* New York: Penguin Books.

Cicero, Marcus Tullius, Rackham, H., Sutton, E.W. 1959. *De oratore*, Books I–II. Loeb Classical Library, No. 348. Cambridge: Harvard University Press, 463–473.

———, Caplan, Harry. 1954. *Rhetorica ad herennium.* The Loeb Classical Library, No. 403. Cambridge: Harvard University Press, III, xvi–xxiv.

Deline Uranium Committee. 1998. '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, Northwest Territories, Canada. Deline: Dene First Nation of Déline Uranium Committee.

Derrida, Jacques. 1995. Whom to give to knowing not to know. In *The gift of death.* Trans. D. Wills. Chicago: University of Chicago Press, 53–81.

Dombrowsky, Wolf R. 1987. Critical theory in sociological disaster research. In *Sociology of disasters: Contribution of sociology to disaster research.* Ed. Russell R. Dynes, Bruna De Marchi, and Carlo Pelanda. Milano: Franco Angeli.

Eldorado Gold Mines Limited. 1938. *The romance of radium.* Toronto: Eldorado Gold Mines Limited.

Erikson, Kai T. 1995. Notes on trauma and community. In *Trauma: Explorations in memory.* Ed. Cathy Caruth. Baltimore: Johns Hopkins University Press, 183–199.

Evenden, Matthew. 1999. The northern vision of Harold Innis. *Journal of Canadian Studies* 34, no. 3: 162–186.

Felman, Shoshana, and Laub, Dori. 1992. *Testimony: Crises of witnessing in literature, psychoanalysis and history.* New York: Routledge.

Fraser, Sir James George. 1951. *The Golden Bough: A study in magic and religion*, Abridged Edition. New York: Macmillan Company.

Freud, Sigmund. 1959a. *The aetiology of hysteria* 1896. In *Collected papers*, Volume 1. Trans. J. Riviere. New York: Basic Books, 183–219.

———. 1985a. *Civilization and its discontents.* In *Civilization, society and religion, group psychology, civilization and its discontents, and other works.* Trans. J. Strachey. Vol. 12. Pelican Freud Library. New York: Penguin Books.

———. 1985b. *Future of an illlusion.* In *Civilization, society and religion, group psychology, civilization and its discontents*, and other works. Trans. J. Strachey. Vol. 12. Pelican Freud Library. New York: Penguin Books.

———. 1959b. A note upon the mystic writing-pad 1925. In *Collected papers*, vol. 5. Trans. J. Riviere. New York: Basic Books, 175–180.

———. 1946. *Totem and taboo.* Trans. A.A. Brill. New York: Vintage.

Fritz, Charles E. 1963. Disaster. In *International encyclopedia of the social sciences*, vol. 4. Ed. David L. Sill. New York: Macmillan Company.

Gilbert, Claude. 1998. Studying disaster: Changes in the main conceptual tools. In *What is a disaster?: Perspectives on the question*. Ed. E.L. Quarantelli. New York: Routledge, 11–18.

Groom, A.J.R. 1962. U.S.-Allied relations and the atomic bomb in the Second World War. *World Politics* 15, no.1: 123–137.

Halbwachs, Maurice. 1980. *The collective memory*. Trans. L.A. Coser. New York: Harper Colophon Books.

Hatfield Consultants. 1985. *An evaluation of environmental conditions associated with an abandoned uranium mine at Rayrock, and Echo Bay*. Yellowknife: Science Institute of NWT.

Hewitt, Kenneth. 1998. Excluded perspectives in the social construction of disaster. In *What is a disaster?: Perspectives on the question*. Ed. E.L. Quarantelli. New York: Routledge, 75–91.

———. 1997. *Regions of risk: A geographical introduction to disasters*. Essex: Addison Wesley Longman.

Hutton, Patrick. 1993. *History as an art of memory*. Hanover: University of Vermont Press.

Innis, Harold. 1950. *Empire and Communications*. Toronto: University of Toronto Press.

Isacsson, Magnus. 1990. *Uranium*. [48 min., video]. Ottawa: National Film Board of Canada..

Jenkins, Robert G. 1999. *The Port Radium Story*. Summerland, BC: Valley Pub.

Laplanche, Jean. 1976. *Life and death in Psychoanalysis*. Trans. J. Mehlman. Baltimore: Johns Hopkins University Press.

Laub, Dori, and Auerhahn, Nanette C. 1993. Knowing and not knowing massive psychic trauma: Forms of traumatic memory. *International Journal of Psycho-Analysis* 74, no. 2: 287–302.

Leys, Ruth. 2000. *Trauma: A genealogy*. Chicago: University of Chicago Press.

Macdonald, Claudine. 1938. radium mining in the Arctic. *Travel* 70, no. 4: 7–11, 44–45.

McNally, David. 1981. Staple theory as commodity fetishism: Marx, Innis and Canadian political economy. *Studies in Political Economy*, vol. 6: 35–63.

———. 1986. Technological determinism and Canadian political economy: Further contributions to a debate. *Studies in Political Economy*, vol. 20, Summer: 161–169.

Neill, Robin. 1969. Harold Adams Innis: *Canadian Economics, Journal of Economic Issues*, vol. 3, September: 3–15.

Neuzil, Mark, Kovarik, Bill. 1996. *Mass media and environmental conflict: America's green crusades*. London: Sage.

Nora, Pierre. 1989. Between memory and history: Les lieux de mémoire. *Representations*, vol. 26, Spring: 7–25.

Northern Transportation Company Limited. 1967. *The highway of the atom*. [32 min., film]. Ottawa: Crawley Films.

Paz, Octavio. 1974. *Order and accident, in conjunctions and disjunctions*. Trans. H.R. Hunt. New York: Viking Press, 91–139.

Porfiriev, Boris N. 1998. Issues in the definition and deliniations of disasters and disaster Areas. In *What is a disaster?: Perspectives on the question*. Ed. E.L. Quarantelli. New York: Routledge, 56–72.

Quintilian and Butler, Harold Edgeworth. 1959. *The instituto oratoria*, vol. IV. Trans. H.E. Butler. The Loeb Classical Library. Cambridge: Harvard University Press, Book X, ii, pp. 211–243.

SENES Consultants Limited. 1994. Report on Phase I, II, and III Investigations of the Historic Northern Uranium Transportation Network in the Northwest Territories and Northern Alberta, Port Hope: Low Level Radioactive Waste Management Office.

Sexty, Robert W. 2000. Stamping our history: The story of Canadian business as portrayed by postage stamps. *Revue Canadienne des Sciences de l'Administration* 17, no. 4, December: 332–342.

Spence, H.J.M. 1989. Grandfather and the Great Bear. Available: ww.uilondon.org/grand.htm [Accessed January 2002].

van der Kolk, Bessel A., and van der Hart, Onno. 1995. The intrusive past: The flexibility of memory and the engraving of trauma. In *Trauma: Explorations in memory*. Ed. Cathy Caruth. Baltimore: Johns Hopkins University Press, 158–182.

van Wyck, Peter C. 2002. The American Monument. *Alphabet City* 8: Lost in the Archives.

———. Forthcoming. *Dangerous signs: An essay on waste, threat, and trauma*. Minneapolis: University of Minnesota Press.

———. 1997. *Primitives in the wilderness: Deep Ecology and the missing human subject*. Albany: State University of New York Press.

Watkins, Mel. 1977. From underdevelopment to development. In *Dene Nation: The colony within*. Ed. Mel Watkins. Toronto: University of Toronto Press, 84–91.

Wolfenstein, Mary. 1957. *Disaster: A psychological essay*. London: Routledge and Kegan Paul.