The Senses and the History of Technology

by Joy Parr

Abstract
This paper reprises the core argument of "Sensing Changes: Technology, the Environment, and the Everyday" and provides brief summaries of six of the case studies. The paper was first delivered as the keynote address in Dresden in May 2013, at the Annual Conference of the German Society of the History of Technology focussed on Technology and the Senses. The large engineering works of the postwar period by remaking landscapes made the practices of work and dwelling and thus retuned the senses and the discerning features of sensing bodies.

Überblick
Der Beitrag präsentiert die Hauptargumente von „Sensing Changes: Technology, the Environment and the Everyday" und gibt eine kurze Zusammenfassung der sechs Fallstudien. Er basiert auf dem Eröffnungsvortrag – gehalten auf der Jahrestagung der Gesellschaft für Technikgeschichte im Mai 2013 in Dresden, die den Themenschwerpunkt „Die Sinnlichkeit der Technik" hatte. Die Vorlesung beschreibt, wie einige große Ingenieurprojekte der Nachkriegszeit durch die Transformierung ganzer Landschaften die damit zusammenhängenden Lebens- und Arbeitspraktiken prägten und damit die Sinne sowie die körperliche Sinneswahrnehmung der beteiligten Akteure re-konfigurierten.

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We, as students and researchers in the histories of technologies and environments, have much to gain by attending closely to sensing bodies, our own and those of others. Both as receptors and archives of sensuous information, bodies are fundamental to the connections between the people whose histories we read and write, their tools and the places where they live, work and play. To historicize the senses we need to open interpretive space in which to study the robust materiality of technologies and environments, to encounter them as directly and fleshly as possible, rather than as they are codified symbolically in language.

Many of the senses which come most readily to conscious mind – sight, hearing, touch, taste and smell – in our time are readily expressed in words. Sight and hearing are the ways humans interact most with the world *externally* and thus the most readily verifiable, and amenable to the standards of

empirical testing and replication preferred by scientists. Comparatively it is relatively easy to agree that we are seeing or hearing the same thing as the person beside us. Seeing and hearing are also the senses cultural critics and science studies scholars are most likely to borrow as they search for bodily metaphors to express socially constructed institutions of knowledge. Think of how panopticon is used to convey power to monitor in many dimensions, or resonance to suggest the diffuse meanings which emerge from a source. This is *epistemological embodiment*, and the way in which the term embodiment has been most commonly used by those practiced in the linguistic turn.

Much of the bodily knowledge that comes from interactions with the world is not readily captured in words. Michael Polanyi called it *tacit knowledge*,[1] what *we know but cannot tell*. Pierre Bourdieu called it *habitus* following on the work of the phenomenologist Maurice Merleau-Ponty.[2] Mark Hansen calls it *experiential excess*,[3] excess because while it is securely held in bodily experience it eludes expression through language. In 1992, William Cronon made a disheartening attempt to make the *linguistic turn* in his own work.[4] Respectful though he was of his literary colleagues' insights, he found so much tacit knowledge and experiential excess in the world he wanted to know that he concluded the narrative form was *dangerous* for his purposes. The ecological senses of non-linearity and randomness which were the focus of his attention, *by their nature* were synthetic rather than categorical. In their way of being, they were fluxes and fusions which the strict linear progression of words, what he called the *rhetorical razor* of discourse and narrative, could not adequately convey.

These sensuous ways of interacting with the world are best distinguished as phenomenological or *corporal embodiments*.[5] By their resistance to communication in words, the parts of technologies and environments accessible through these senses were those most marginalized by the methodological turn to discourse analysis. Because they are so central to the processes of dwelling and work, it is hard not to agree with Cronon, that bringing them into the foreground of the history of technology should be a priority.

1 Michael Polanyi, chapter "Tacit Knowing," in his *The Tacit Dimension* (Garden City/NY 1966), 3–25.

2 Marcel Mauss, "Les techniques du corps", *Journal de psychologie* 32 (1936), 363–386; Pierre Bourdieu, *Outline of a Theory of Practice* (Cambridge 1977), 78–87.

3 Mark Hansen, *Embodying Technesis: Technology beyond Writing* (Ann Arbor 2000).

4 William Cronon, "A Place for Stories: Nature, History and Narrative", *Journal of American History* 78, No. 4 (1992), 1347–1376.

5 N. Katherine Hayles, "Foreword: Clearing the Ground", in: *Embodying Technesis*, ed. Mark Hansen (Ann Arbor 2000), vii; there are case studies within environmental history, see Peter Coates, "The Strange Stillness of the Past: Toward an Environmental History of Sound and Noise", *Environmental History* 10, No. 4 (2005), 636–665, especially 656; Joy Parr, "Smells Like?: Sources of Uncertainty in the History of the Great Lakes Environment", *Environmental History* 11, No. 2 (2006), 282–312.

Humans know the world by interacting with it. What they know about it and how they organize and reason with that knowledge is "marked by the particularities of our circumstances as embodied human creatures."[6] What are these particularities? Some of these we can assume persist over long stretches of history and across cultures.[7] Humans stand upright and are a certain distance above the ground when they crouch or sit to rest. They walk and run within a certain range of speeds and can reach to touch within a certain distance. Within a certain range, they can retain their balance while moving on slopes and shifting ground. These we could group as proprioception, the sense of bodily knowing in space; kinesthetics, the gait, pace and posture with which the moving body encounters its surroundings; and proxemics, the emotional comfort with nearness and distance. Some of these change with the life cycle and over time. A child's sense of *too high* is different from an adult's; the medieval sense of *close quarters* in a dwelling was different from yours and mine. Some are altered by contemporary technologies. Think of the difference in *an hour away* to a walker, a cyclist, and an air traveller, or of *clean enough for comfort* in a household with a washing machine rather than a scrub board, or a vacuum cleaner rather than a broom.[8]

Bodily encounters with technologies and environments occur profoundly through the internal senses of taste, touch, and smell. These are the senses Barbara Duden of the Leibniz Universität Hannover separates out as knowledge held "beneath the skin," and those Elaine Scarry, in her studies of pain, characterizes as "resisting representation."[9] These senses, with propriception, kinaesethetics, and proxemics, are less welcome than the external senses by scientists seeking evidence and by science studies scholars seeking conceptual analogies specifically because they resist representation and simplification in symbols and models. Physicians in the early modern period, participants in the making of science of their time, shifted from using internal to external signs of illness in their diagnoses and came to less often ask their patients *how are you*, meaning what can you yourself sense changes inside your body, and more often assert *I can see how you are*. This change was radically elab-

6 Cronon, *A Place for Stories*, 1347–1376.

7 Pierre Bourdieu, *The Logic of Practice* (Cambridge 1990), 56.

8 N. Katherine Hayles, "Situated Nature and Natural Simulations: Rethinking the Relation between the Beholder and the World", in *Uncommon Ground: Toward Reinventing Nature*, ed. William Cronon (New York 1995), 409–425 and N. Katherine Hayles, "Searching for Common Ground", *Reinventing Nature? Responses to Postmodern Deconstruction*, ed. Michael E. Soulé a. Gary Lease (Washington 1995), 46–63.

9 Barbara Duden, *Women Beneath the Skin: A Doctor's Patients in Eighteenth-Century Germany* (Cambridge/MA 1991), 14–15, 35–37, 79–80; Barbara Duden, *Disembodying Women: Perspectives on Pregnancy and the Unborn* (Cambridge/MA 1993), 91–92; Isabel V. Hull, "The Body as Historical Experience: Review of Recent Works by Barbara Duden", *Central European History* 28, No. 1 (1995), 75–79, see 75; Elaine Scarry, *The Body in Pain: The Making and Unmaking of the World* (Oxford 1985) and Elaine Scarry, *Resisting Representation* (Oxford 1994).

orated in the twentieth century. Diagnosis by physical examinations which used touch (through palpitation), smell, and hearing (through stethoscopes) became less central than electronic apparatus which yielded graphic output which practitioners can see and compare.[10]

But these scientific and science studies simplifications that attend most to the external senses and set aside bodily knowledge, favouring instead models and ungrounded theory, have come at some cost. For those of us seeking to know the full complexity of the relationships amongst humans, their environments, and technologies, these discarded material manifestations through the body are indispensable. For us they are not *experiential excess* but key to what we need to know about human interactions with their tools and with their physical settings.

The processes of corporeal embodiment have histories. The senses have been tuned over time to bring to human bodies different qualities as human interactions with environments and technologies have changed. The most commonly cited example is the presence of moveable type, which made people more dependent on their eyes and, as they became less reliant on their ears, less practiced listeners.[11] Because the senses have been retuned by human experience with technology and the environment, treating the differences between them as separate, distinct, and persistent over time would be a mistake.[12] Thus, the leading practitioner in the history of the senses, Alain Corbin, after elegant monographs on odour and sound, turned to integrated studies of the sensing self in time and place. He wrote ecologically about the full-bodied experiences of nineteenth-century people with the sea-side and embarked upon a multi-sensory project to follow Louis-François Pinagot, a nineteenth-century craftsman, through the *natural and social landscapes* he inhabited, emphasizing not difference but synaesthesia, the qualitative commonalities and shared conduits of the sensing body.[13] Recovering these different ways of recognizing and organizing knowledge of the world, the accumulation of specific actions in specific places, can be particularly valuable to us as students of the relationships among people, technologies, and the

10 Stanley J Reiser, "Technology and the Use of the Senses in Twentieth-Century Medicine", in *Medicine and the Five Senses*, ed. W. F. Bynum a. Roy Porter (New York 1993), 262–273.

11 Marshall McLuhan, *Gutenberg Galaxy: The Making of Typographic Man* (Toronto 1962); Walter J. Ong, "The Shifting Sensorium", in *The Presence of the World*, ed. idem (New Haven 1967), 1–9.

12 Elizabeth Grosz, "Bodies and Knowledges: Feminism and the Crisis of Reason", in *Space, Time and Perversion*, ed. idem (London a. New York 1995), 25–44, see 31; Leslie Adelson, *Making Bodies, Making History: Feminism and German Identity* (Lincoln 1993), 12, 16 a. 23.

13 Alain Corbin, *The Foul and the Fragrant: Odor and the French Social Imagination* (Cambridge/MA 1986); idem, *Village Bells: Sound and Meaning in the Nineteenth Century French Countryside* (New York 1998); idem, *The Lure of the Sea* (Oxford 1994); idem, *Histoire du corps* (Paris 2005).

senses historically. To do so, we must pay attention to the *complex specificity of human bodies*, in themselves researchable legacies of sensation, *not merely products of discourse or objects of institutionalized power*.[14]

The next part of the *how* is to create more robustly material histories of technologies and environments. After we have become aware, first, that bodily interactions with the world include deeply unconsciously embodied senses such as proprioception, kinaesthesia, and proxemics organized by the size and capabilities of human skeletons and musculature, second, that the five senses – sight, hearing, touch, taste, and smell – differ in how readily they can be expressed in words, and third, that historically they are refined by technologies and activities, we need to find a more encompassing way to characterize the complex flow of embodied knowing from these experiential interactions. Katherine Hayles built upon the insights of the Chilean cognitive psychologist Humberto Maturana, who before her had emphasized that *the processes involved in our activities* constitute our knowledge, and recommended attending to the particular *relational and operational spaces* of living systems as material matters of doing, rather than separating sensations, perceptions, and cognitions.[15] Hayles characterizes the bodily registering of interaction with the world beyond the skin as a *flux*.[16]

Hayles's rendering is that we have awareness *before conscious thought forms*.[17] There is a stark departure here from analysis through the social construction of gender and sex. Rather than postulating that meaning precedes experience,[18] and that humans know the world through the meanings they share symbolically in language, Maturana, Hayles, and Paul Connerton, Francisco Varela, and Pierre Bourdieu and Maurice Merleau-Ponty[19] suggest that humans

14 Sima Godfrey, Alain Corbin, "Making Sense of French History", *French Historical Studies* 25, No. 2 (2002), 395–396; Alain Corbin, *The Life of an Unknown: the Rediscovered World of a Clogmaker in Nineteeth-Century France* (New York 2001); Adelson, *Making Bodies*, 1 a. 3.

15 Humberto Maturana a. Bernhard Poerksen, *From Being to Doing: the Origins of the Biology of Cognition* (Heidelberg 2004), 16–17; Humberto Maturana a. Francisco Varela, *Tree of Knowledge: The Biological Roots of Human Understanding* (Boston 1992), 24.

16 Varela et al., "The Embodied Mind and Evan Thompson, "The Mindful Body: Embodiment and Cognitive Science"", in *The Incorporated Self: Interdisciplinary Perspectives on Embodiment*, ed. Michael O'Donovan-Anderson (Lanham Maryland 1996).

17 Douglas Harper, *Working Knowledge: Skill and Community in a Small Shop* (Chicago 1987); he is working with the insights first articulated by Mauss as bodily techniques (see footnote 2).

18 Joan Scott, "The Evidence of Experience", *Critical Inquiry 17*, No. 4 (1991), 773–797; Idem, *Gender and the Politics of History* (New York 1988).

19 Paul Connerton, *How Societies Remember* (New York 1989); Francisco Varela, Evan Thompson a. Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge/MA 1991); Maurice Merleau-Ponty, *Phenomenology of Perception* (New York 1962); Bourdieu, *Outline*.

make sense[20] of the world, (for our immediate shared purposes), of technologies directly through their sensing bodies. By storing the consistencies in this awareness, humans become habituated to their habitats, comfortable as practiced users of their tools,[21] and share what they have learned directly, by imitating one another. In this sense, humans are not first language bearers, but to use Varela's term, embodied minds.[22] Embodied perspectives allow us to tap into more of the knowledge humans have and more about the reasoning they employ as they use technologies in the places where they dwell, work, and play.

Isabel Hull, an historian of Germany and a former editor of the *American Historical Review*, writing in 1995, argued that the knowledge and reasoning I have been calling here corporeal embodiment, was particularly amenable to exploration by "self-reflexive, scrupulous historicism,"[23] and suggested that by following the practices of the historian's craft we can reclaim these important but recently marginalized elements of human experience.

I spent most of the 1980s talking with women about their household choices of domestic goods. My motivation then was not to learn more about embodiment or its more recent presentation, neuroplasticity, but to understand more about macroeconomic policy as it influenced the design, functionality and resource use of furniture and domestic technologies in two democratic regimes rebuilding after the WWII and the depression of the 1930s. The cases were Canada and Sweden. But as a physicist friend of mine often affirms, "Research is what I'm doing when I don't know what I'm doing." My own most valuable *take-away* from that work was about the importance of scale in domestic environments, in the relationships between work and bodies. Domestic Goods, the Material, the Moral and the Economic in the Postwar Years was published in 1999. And I began then to look around for something new. I was teaching in British Columbia, on the Pacific Coast of Canada, 2/3s of a continent away from the Great Lakes region where I first encountered, to quote Barbara Duden, the *world beyond my skin*. The Fraser River flowed past the foot of the street where we lived in New Westminster, formerly a fur-trade post, and the first capital of the province of New Caledonia. The river was ancient and the descent to its banks steep, a contrast from the gently rolling farmland of my home place. The cloud ceiling hovered low most days, and usually there was a gentle rain and what Newfoundlanders call a mausie light, different to the eye and to the skin from the high skies and strong sunlight in the villages where I'd learned light from dark and wet from dry. As I leaned on the rail

20 Joe Corn, "Textualizing Technics: Owner's Manuals and the Reading of Objects", American Material Culture: The Shape of the Field´, ed. Ann Smart Martin a. J. Ritchie Garrison (Winterthur 1997), 169–194; Hayles, *Foreword*.

21 This phrase is Isabel Hull's praise for Barbara Duden's practice, Hull, *The Body*.

22 Varela et al., *The Embodied Mind*.

23 Hull, *The Body*, 75.

which separated the human traffic at the *farmers* market from the ferries and barges plying the river, I was not uncomfortable, but curiously discomfited, estranged, wondering how long it would take for this place to be as familiar, from the inside out as it was from the outside in. How long would it take for me to embody this place, its weather, its dailyness? In the conceptual frame now beginning to succeed the linguistic turn, the neurological turn, how long would it take for the neurons newly firing together to wire together?

From scale to the senses was an easy slippage, at least for an economist/geographer/historian interested in technologies. Still researching what we know but cannot tell, write or print, – researching the tacit – is a challenge.

Important as the senses are in the redesign and redeployment of technology, these neurological connections, what we sensuously tacitly know but cannot convey through texts, understandings which elude speech and most symbolic representation, have thrived in neither the seminar room nor the lecture hall. The fusion and flux, which is their nature, eludes the stabilization of the text, and hence the stern fixity effected by capitalism through and for the market, the reading of quality (qualities) through price (and in the terms closest to home for us) of the worth of the tenure file. It seemed best to leave the domestic behind and go big.

From sea to sea in postwar Canada*, mare usqua ad mare* as the phrase is embossed on our coat of arms, we, Canadians, built megaprojects, large dams to alter the volume and direction of flow of rivers, canals to move the head of navigation thousands of miles inland from where previously it had been, nuclear power plants and the heavy water plants to provision them, NATO bases to train troops and test equipment and weaponry for the Cold War. To make changes in the sensing body researchable, to find human inhabitants who could give voice, to tell the tacit transformations in their sensing bodies, I spent the next decade living amongst, listening to and working with people in the way of the massive infrastructure improvements of the postwar years, of the Golden Age of Capitalism, the term economic historians use for the period in Europe. I was, tracking, trying to make researchable, how the megaprojects had transformed local people's most intimate experience of themselves and their environments. As I listened to residents in these six contexts, the focus of my attention was drawn from the megaprojects to the processes by which inhabitants adapted to the habitats the megaprojects had transformed. Local people recounted how these radical changes had unsettled their daily lives, forced them to encounter their environment anew and adapt the practices through which to live competently and sustainably day by day. They described a collective relearning of what to infer was ordinary and exceptional in the winds and the weather, in the lakes, rivers and native vegetation which surrounded them, in the requirements of the crops and livestock they tended, and the aquifers, fish, and wood upon which they depended. These were the interfaces where their active sensing bodies, through the technolo-

gies they used and the practices they deployed, engaged their environment as habitat – as sites of mutual remaking. Human bodies tuned to one world beyond their skin, which once had seemed *the world*, by sensing the differences and sensing differently retuned to another. They talked about learning to recognise and work with a different *ordinary* beyond their skin, to find ways to adapt this new *natural* to their purposes. Their accounts of these crises of competence and confidence, when the recognition of these disjunctions lead then to revise their inferences from sensuous signs and reconsider effective practice, changed the course of my journey amongst them. For here, in these radical disjunctures, were researchable traces of human bodies being made contextually, temporally and spatially specific.

The megaprojects of the postwar years were true to their name. They were big, and in their wake followed daunting and unfamiliar clashes of scale. Neither vegetation nor landforms could persist against the huge machines moving earth to create hydro dams and deep water channels to take ocean-going ships up the Seaway to the centre of the continent. Nor would the plans of the Canadian state be much altered to accommodate the preferences of the families who had dwelled by the river for generations. As inhabitants incorporated into their bodies the altered world beyond their skins, awarenesses they usually held beyond telling as habit and reflex became urgently speakable. This process of

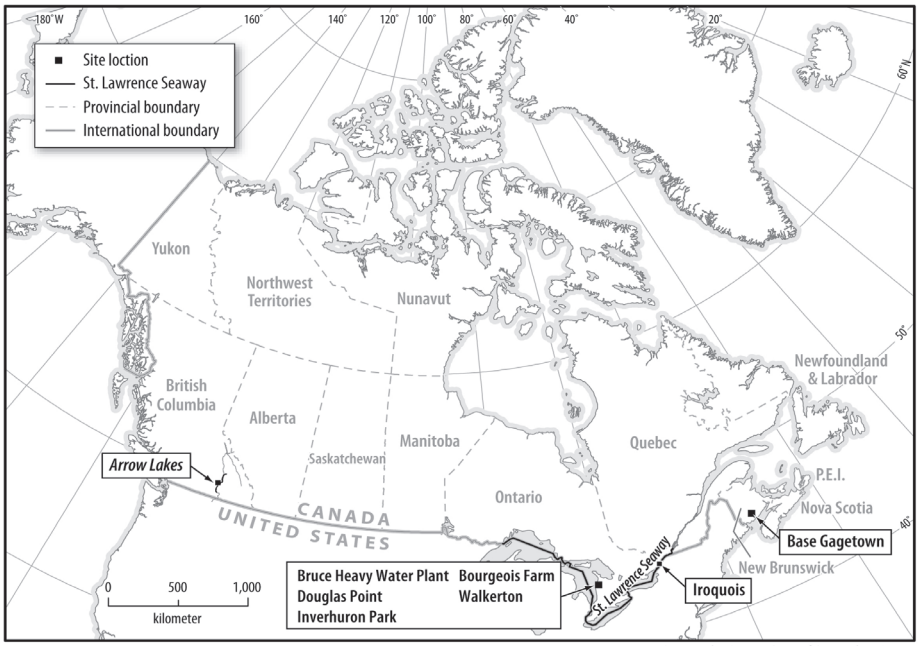

Fig. 1: Map of the sites (Source: Cartography Section, Department of Geography, University of Western Ontario).

habituation to habitat through the tuning of the senses and the honing of habit and reflex is embodiment. The report upon their encounters with embodiment both as active adaptation to changed circumstances, and as *the whispering of ghosts*, relicts of past successful adaptations to familiar worlds later remade, persisting as familiars, reminders of losses and also sources of resilience and resources for rebuilding. Let's begin an episodic transcontinental tour of the sites to test out these possibilities in practice.

The Columbia and Arrow Lakes[24]

We'll go from west to east, beginning with the Columbia River rising near the Alberta/British Columbia border and debouching into the Pacific between Seattle Washington and Portland Oregon. For Arrow Lakes residents, the waters of the Columbia were a central *reference point*, an internalized *compass bearing* through which their sense of direction and their perceptions of distance and depth, unconsciously and corporally, were merged. Before the dams were built, in the 1960s, the continuities in time passing were marked by the steadily moving river, its changes heralding the different rhythms brought by each season for work and pleasure in the valley. With the dams, the waters changed. They became commodities. They moved as commodities move, in response to demand. James Wilson, the BC Hydro planner, 20 years ago observed how the contours and features of the shoreline, the flora and fauna, "the slant of the sun, morning and evening, the wind on the waters and the waves slapping on shore" had been woven over time into the daily living patterns of those who dwelled among them and had assimilated them, we know not how, into their psyches. People of the valley knew the moving river by bodily encounters. "You miss the lake because it was there and *near* to you." "The lake had beautiful beaches because of that nice tide and it *kept everything washed.*" Their own seasonal rhythms were in time with the changes in the shoreline made by the cycles of the river's movement, and the attendant changes in the depth, temperature and speed of the water. They knew as nature/second nature when certain beaches emerged, when sandbars became available to water cattle, when sheltering points and islands made the water comfortable and safe for swimming. Their competence as providers depended on a series of honed tacit assumptions about how the moving wind altered the moving water, how the volume of the flow changed the depth and the currents in narrows though which logs must pass, how to use the lands yearly enriched by silt deposited by the spring floods, when the fish would be in the streams and the deer browsing by the shore.

24 The subsequent discussion follows closely the case studies in Joy Parr, *Sensing Changes: Technologies, Environments, and the Everyday, 1953-2003* (Vancouver 2010), beginning with Chapter 5 *A River Becomes a Reservoir*, 103–136.

Fig. 2: The Gagetown Lands before the military base was built: a farm woman waiting for the cream truck, cleared fields before, village behind, good road network and rural electrical service. (Source: Family Herald and Weekly Star, n.d.).

Gagetown[25]

The Canadian Forces Base at Gagetown, New Brunswick, set back from the Saint John River, near the Atlantic seaboard and just north of the US border, was established during the Cold War to train NATO troops. The base took up on 370 square miles of developed meadows and timber lands created over several generations by Protestant Loyalists, refugees from the American Revolution, and Catholic Irish families, fleeing the potato famine. The inhabitants who had made the wood lots and farms ceded lands they had never intended to sell. Thereafter many were employed on the base, some using Agent Orange, to clear mazes for tanks and training grounds infantry. The residents' departure was traumatic and, we now know, wrought grave health effects on local nature, both human and non-human.

The bodies of the residents in this area were adapted to their work making stands of timber and Jersey herds, their unmaking to accommodate the Base, and the subsequent remaking of local religious and language identifications when the British Dominion for which residents had been willing to make sacrifices, was reconstituted as a bilingual and multicultural Canada.

25 See ibid., 25–52.

Radiation Protection[26]

Two sites, the Bruce Generating Stations on the eastern shore of Lake Huron, in Ontario and the Point Lepreau station, near the Maine border in New Brunswick, are the locations for a study of how embodiment figured within a nuclear occupational health and safety regime. The workers, at these generating stations, mostly men, came to nuclear work from farming, forestry, the fishery, chemical industries and shipyards, occupations where the signs of danger were physical. They learned to adapt to work in the radiation fields of nuclear generating stations, by reading instruments, attending to proxies for insensible dangers, and modifying their gait and posture to stay within the registering range of their instruments.

Canadian radiation protection practices are singular among early nuclear sites in their unhierarchical work rules. Each employee was responsible for his own safety. Each learned the theory of ionising radiation so as to infer, from the measurements their instruments registered, the bodily practices to keep themselves safe. These physical habits and reflexes substituted for the somatic signs of their former workplaces, and for the military discipline in nuclear generating stations in the US and Europe. The elements in the design of Canadian stations which accommodated these work routines are part of the story. Another part less readily apparent in the textual transcripts of the oral histories than audible in the hesitations, repetitions and intonations of the digital sound records, is the bodily retuning to signs of danger and safety by which men adapted to this technological transformation in their occupation.

Iroquois[27]

Iroquois was the first of the St. Lawrence villages remade to accommodate the Seaway. And remade it was, its stores and garages, streets, sewers and schools, places of worship, work and play, the houses which could bear it, and their residents, whose forbearance was not questioned, 1,049 people and 151 structures, moved a mile north from the old river's edge onto pasture land beyond reach of the coming flood. By the summer of 1958, the early nineteenth-century river village was gone; its remnants submerged beneath the rising waters of the pond behind the Robert Saunders-Robert Moses dam. In its place, in a form transferred precisely from the drafting boards of the Hydro architects and planners, was a model town. There, a modern plaza, its back to the village, fronting onto a parking lot, engaged the promised traffic of the new highway. Beyond, partially obscured from view along an incongruous suburban sequence of curved streets, villagers, resettled in transported dwellings, shorn of their porches, perched on new foundations. New bungalows, austere in their promised convenience, bordered the planners' projection of a park.

26 See ibid., 53–78.
27 See ibid., 79–102.

Fig. 3: The village of Iroquois before the Seaway was built. (Source: National Air Photo Library).

In Iroquois too, managing without the river was going to be tough for everyone. Their bodies were familiars of the river, their senses of self dependent upon time-worn knowledge of the St. Lawrence and its ways. The river was "your scenery … you'd go back to the back streets and the side streets, but you'd always be looking at the river over there, by these houses. The river was always there." Even for adults, pressed by responsibilities as parents and wage-earners, church and community leaders, the river was a vicarious pleasure, an enveloping, prospective solace. "I loved that water, … loved to see other people out enjoying themselves, … when I did find time, I just loved the river … just the fact that I could go out and wander around and stand around." Aurally, the river was the keynote of the village. "Normally the river was fairly quiet, but you knew it was there." It had an ambient quality of shifting precedence. "I know at night many times my father's been fishing across the river and I'd go down to meet him, and … I'd sit there – you could hear the river, it was quite rough and you could hear it very plain." Sometimes the river was a signal. "You could hear it slapping up against the banks, rough days when it was windy." But most days the river was the barely perceptible yet comforting ordinary of the village soundscape, a kind of muted roar. This keynote had a deep and pervasive influence on the behaviour and moods of

those who lived with it, in the background until the day when the coffer dam, built to hold back the river so that construction could begin, was closed. Then the river and its rapids became thunderously inaudible.

The Heavy Water Plants[28]

In 1969, plans for a new installation at Bruce Nuclear Power Development were announced: a plant to produce the heavy water that served as coolant and moderator in Canadian nuclear reactors. The key impact the heavy water plant would have on the surrounding sensory environment was olfactory: the odour of hydrogen sulphide (H_2S), an air-borne by-product of the process by which ordinary water was made heavy. The human neighbours, campers and a pastoral family raising sheep and producing yarn adjacent to the site, and cottagers immediately south of the provincial park, came to know the heavy water plant by the presence of this olfactory sensation – the rotten egg smell of hydrogen sulphide released from the plant into the air of their living space.

In the story of environmental hazard on the eastern shore of Lake Huron, smell had a starring role. The first "whiff of danger" was sulphur, at first encounter a strong and readily distinguishable odour. But as an airborne industrial by-product, hydrogen sulphide is particularly menacing. It is a hazard "with poor warning properties." At low levels, 0.13 ppm, it is perceptible to humans as an unpleasant odour like rotten eggs. Ironically, however, at higher and more noxious levels, at 100-150 ppm, this odour ceases to be perceptible. This is not a mere cultural habituation, but a daunting visceral dilemma oil field workers learn early in their careers about the "sour gas," H_2S, a common presence in their trade. At middling concentrations, H_2S kills the olfactory cells, physically extinguishing the sense of smell. An oil worker "knows" she is in grave danger when she ceases to be able to the smell the sulphur, or anything else. The next stages of the physiological and perceptual effects are more dire still. At 500 ppm, humans experience excitement, headache, dizziness, and staggering followed by unconsciousness (a consequence known in the oil fields as "knock-down"). Respiratory failure follows within five minutes to one hour.

Because it is heavier than air, when released into the environment at ground level H_2S settles into low areas, persisting invisibly after the release seems to have been borne away by the wind. Survivors of acute exposures have presented with an array of neurological and psychiatric symptoms including memory loss and depression. These material traits made the olfactory perception of H_2S both a source of uncertainty and a ground for suspicion. These were sensations registered in the bodies of the public which at Inverhuron, by reinforcing apprehensions of secret dealings, eroded trust in public organizations. Because their emissions were blown in the wind, the heavy water plants

28 See ibid., 137–162.

were not *poster-child* high technologies, precisely situated in time and space, creatures of calculation, exactitudes disciplined by engineering expertise. Rather, their hydrogen sulphide emissions were a dreadful uncertainty. While their sources could be pin-pointed, their airborne presence eluded specification. Today there are wind farms near the Bruce generating station successfully producing power. During the time of the heavy water plant, these atmospheric characteristics of the site were troublesome rather than constructive.

In these circumstances, tracking the plume of H_2S emissions was a cat and mouse game. Jim Dalton, the estimable veteran superintendent in charge of the plant for Lummis, the transnational construction firm which built the facility, observed, "Given the weather conditions, you had no idea where the plume was going to hit ground. You can make an educated guess, and you do that by sending monitoring teams down the stream of the plume to measure it, to see where it is actually coming down. And so whenever you had a release … first thing, the monitoring teams were dispatched … in complete protective gear and they had monitors…." In the story of the Bruce Heavy Water Plant and Inverhuron Park, smell was key, its most developed quality in this instance, uncertainty, a trait of its material form interpreted variously culturally as safety and duplicity. Its evanescent characteristics – in the absence of precise scientific measurement and interpretation – amplified doubt, corroded facades of quiet authority, and discounted the fables of political convenience crafted to cover over flawed assessments of risk. The places where they met, these technologies, these private and public bodies, and the livelihoods and landscapes they shared, were defined spatially and topographically within a sensorium which privileged smell. The sensorium, the way the senses are arranged and mutually infuse, here is plainly at once an analytical tool and a character at play in historical events, an element with particular force out in the open air of the history of technologies and environments. When those bodies had different exposure histories, what would the measurements signify? Whether the reliance on monitors was as adequate as individuals' own senses, a question which figured in public controversies locally through the history of the site.

Often, then, there is more than meets the eye in environmental histories and histories of technology. Not only will displacing the visual as the primary conduit for environmental knowledge multiply how much we can know about the material and cultural world, this broader embrace of the sensuous offers the opportunity to know differently. In a more sensuous and embodied environmental history, the senses become recognizable, qualitatively distinguishable and synergistically companionable, the body both the archive and the instrument tuned to these encounters.

Walkerton and Taste[29]

The sixth instance, the water contamination, occurred in May 2000 and takes us from the brute force physical disruptions and population displacements of modernist megaprojects to environmental and technological challenges to embodied knowledge and local sovereignty likely to be more common in the twenty-first century.

This instance hinges on a freak weather event, the intensification of livestock production and the implementation of science-based regulatory regimes to discern environmental hazards. As with the studies of how the neighbours of twentieth century megaprojects learned how to cope with unbidden technological and environmental change, so the twenty-first century Walkerton case is a Canadian instance with wider resonance and relevance.

Conclusion

Because the historical study of embodiment is relatively new, and the cases and places here will be unfamiliar to many readers, we need to make the case for embodiment, specifically corporeal embodiment, as an historical process. While in some cases, language is the filter which organizes perception (this is embodiment as a figure of speech as it was commonly employed by literary scholars and some historians during and after the linguistic turn of the late twentieth century), often we know directly by sensing and doing, by corporeal embodiment. We make meaning by doing, and organize our awareness and skill through bodily practice. The body is a synthesizing instrument which defies the categorical and linear discipline of language and science. The environments and technologies with which we live, play and work, lead us to develop specific modes of bodily attention and perception. This tuned reciprocity amongst body, environment and technology has allowed humans, historically, to feel at home, competent and safe. Creating environmental histories and histories of technologies, which borrow more prodigiously from sensory history, attending explicitly to these sensuous adaptations and the habits that organize them into practice, will capture better both the challenges and possibilities changes in habitat and technique pose.

Anschrift der Verfasserin: Joy Parr, 18 Huron St. North, Southampton, Ontario N0H 2L0, Kanada, Email: jparr@uwo.ca

29 See ibid., 163–188.