

Scientia Canadensis

Canadian Journal of the History of Science, Technology and Medicine
Revue canadienne d'histoire des sciences, des techniques et de la médecine



Made Modern: A Roundtable Review

Edward Jones-Imhotep & Tina Adcock, eds. *Made Modern: Science and Technology in Canadian History*. Vancouver: UBC Press, 2018. Xii+376 pp. \$34.95. ISBN 9780774837248

Elsbeth Heaman, Arn Keeling and Sverker Sörlin

Volume 42, Number 1, 2020

URI: <https://id.erudit.org/iderudit/1071266ar>

DOI: <https://doi.org/10.7202/1071266ar>

[See table of contents](#)

Publisher(s)

CSTHA/AHSTC

ISSN

1918-7750 (digital)

[Explore this journal](#)

Cite this review

Heaman, E., Keeling, A. & Sörlin, S. (2020). Review of [Made Modern: A Roundtable Review / Edward Jones-Imhotep & Tina Adcock, eds. *Made Modern: Science and Technology in Canadian History*. Vancouver: UBC Press, 2018. Xii+376 pp. \$34.95. ISBN 9780774837248]. *Scientia Canadensis*, 42(1), 96–111. <https://doi.org/10.7202/1071266ar>

All Rights Reserved © Elsbeth Heaman, Arn Keeling and Sverker Sörlin, 2020

This document is protected by copyright law. Use of the services of Érudit (including reproduction) is subject to its terms and conditions, which can be viewed online.

<https://apropos.erudit.org/en/users/policy-on-use/>



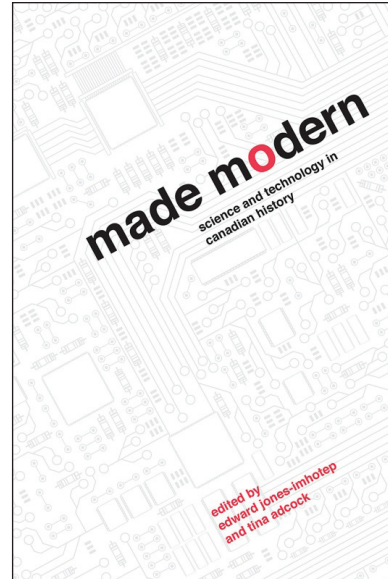
This article is disseminated and preserved by Érudit.

Érudit is a non-profit inter-university consortium of the Université de Montréal, Université Laval, and the Université du Québec à Montréal. Its mission is to promote and disseminate research.

<https://www.erudit.org/en/>

Made Modern: A Roundtable Review

Edward Jones-Imhotep & Tina Adcock, eds. *Made Modern: Science and Technology in Canadian History*. Vancouver: UBC Press, 2018. Xii+376 pp. \$34.95. ISBN 9780774837248.



“We’ve always been modern”

Elsbeth Heaman

The editors of this splendid collection argue, in a sly nod to Bruno Latour, that “We’ve always been modern,” or at least liked to describe ourselves as such. To identify as Canadian is to identify as a modernizer. Once it became obvious—during the second Industrial Revolution according to James Hull in this volume—that science and technology together yielded power and wealth, Canadian boosters avidly pursued them. Scientists and statesmen wanted standardization with European norms of modernity imposed on a land and polity seen as too wild and backwards. Science and technology seemed to offer a universalized modernity particularly useful for a “new” nation seeking to erase obstacles of geography, identity, and history. Perhaps the most spectacular exemplar of that high-modern erasure was the St Lawrence Seaway, described here by Daniel Macfarlane. But Macfarlane insists that it was a negotiated rather than an authoritarian modernity. Was this modernizing process, which produced so much wealth and power but also so much damage and despair, entered into knowingly? It depends, of course, on what you mean by knowledge and how you understand collective consent and national mandate, both of which get resoundingly debunked in this collection. The “rise” of science and technology in Canada rested as much on misunderstanding as on understanding, as much ignorance (or “agnatology”) as knowledge.¹

Arguments for scientific and technological modernization always played well in Canada. The case for a Eurocentric scientific project of knowledge and development for the Canadian Arctic was made by Richard King as early as the 1830s, Efram Sera-Shriar shows in the only paper on the colonial period. A ramped up and reconfigured version—less English, more transnational and Canadian-inflected—of the argument was more successfully made by the advocates of a big Arctic science expedition in the 1910s. They insisted, Andrew Stuhl shows, that such things shouldn’t be left to trappers; that Canada must supplant local amateurs with internationally recognized and well-funded professionals. The Arctic Expedition and the St Lawrence Seaway were two of the most successful high modernist scientific projects aimed at asserting

territorial sovereignty and control. But others were less successful. Tina Adcock's chapter on the Eastern Arctic expeditions of 1926-27 shows that their projector, George Palmer Putnam, really just wanted to go on a hunting expedition with his son and produce popular adventure books; science was an afterthought. But the hunting was illegal, a clear violation of protections for the wildlife that the expedition was supposed to be studying. Conservationists, appalled to see destruction and self-advertising passing itself off as science, stirred up international tensions around the incident. Edward Jones-Imhotep's chapter recounts similar ambiguities in the career of Gerald Bull. A scientific boy wonder, Bull wanted to build and fire off super big guns, and cobbled together Canadian-American support for their construction in Barbados, where they could be justified as warning off Cuba. Bull left Canada for better funding in the United States but was in over his head and was assassinated, supposedly by Mossad agents to punish a deal done with Iraq. We see in such stories not just the social turn in science and technology studies, but also a turn towards the "new political history." Both are superbly written pieces by impressively talented historians.

Other chapters in the collection show similar ambiguities in popular science: it too was at best commercialized and at worst fraudulent. An account of electrical medicine by Dorotea Gucciardo and an account of the science of the séance by Beth A. Robertson are two sobering reminders that science and technology gained public support as much through spurious claims as rigorous ones. Advertising also had its part in that process: Jan Hadlaw shows us the Bell Telephone Company teaching people how to use dial phones for themselves and Blair Stein shows us Air Canada persuading people to fly south for warm-weather holidays. Science and technology are here debunked not so much as not-true as not-disinterested. Business interests decked out self-interested promotional campaigns with the rhetoric of scientific and technological modernization.

Science and technology were always on the marketplace, a complex and heterogenous marketplace that was simultaneously popular and statist, plural and monopolistic. Another terrific chapter that brings such complex elements together is Eda Kranakis's account of a legal battle in 1998 over Monsanto's Roundup-Ready genetically modified canola. When the company sued a sixty-eight-year-old farmer, Percy Schmeiser, for breach of its patented canola, it had no viable patent on the grain that it had disseminated so promiscuously as to encroach on and affect nearby fields. This was a risky fight but one that Monsanto won, Kranakis argues, by blinding the judges with a slew of experts who glossed over the technical problems with the genetic and microbiological patenting process, as well as the problem of genetic drift. Kranakis quotes a contemporary description of the hapless, befuddled judges as "amateurish." That descriptor, also used to denounce local knowledge in the Eastern Arctic, resonates across the collection as it explores the borderlands of science and society. We may see a certain amateur quality in David Theodore's account



Ontario Hydro model in a warehouse at Islington, Ontario. One of the figures reproduced in Made Modern.
© Ontario Power Generation.

of “small science” as quintessentially Canadian, as seen in a lonely computer scientist, trained in physics, working at the Montreal Neurological Institute. But he was hired to do service work for a larger scientific community very conscious of its collective identity and national prestige.

Why was there so much misunderstanding? One reason is that scientists are ordinary people who sometimes speculate wildly and sometimes lie. Sometimes those rash claims get hardwired into scientific and technological systems, policies, and funding programs. The Canadian government’s hankering after modernity made it highly vulnerable to the most extravagant modernizing pitches. Even if they didn’t lie outright, such pitches reflected a tendency towards “seeing like a state,” as defined by James Scott and cited in this collection: a centralizing, simplifying vision imposed on the world that often wrought terrific havoc in the process of imposition.² But, as the editors and Stephen Bocking point out, science also began to provide empirical evidence of that terrific havoc, measured in the environmental and human costs, and to point towards better policies. Science isn’t the best possible knowledge, but the ability to discard worse for better knowledge.

Bocking’s dense and accomplished piece on “landscapes of science” is alone worth the price of admission. He surveys the shape of Canadian environmental knowledge, policies, technologies, administration, and challenges very broadly. In Canada, “natural systems tend towards extremes, unpredictable

movements of fish and wildlife, countless local variations in forest productivity and seasonal water flow” (262). Here’s a second explanation for so much misunderstanding: Canada is big and diverse and extreme. It continually tests knowledge and disproves it, doling out lessons in intellectual humility to would-be knowers and doers. Canada is a gigantic, perpetual falsification engine. Natural knowledge, Bocking argues, became “unavoidably uncertain” (268). Technology continually moved the goalposts on capturing “waste”: from untapped resources to post industrial pollution and damage. But marketplace and research funding reward a specious certainty that comes to infuse public science, while “subjective ethical considerations become matters of the private sphere” (252). I hear in that remark echoes of Michael Bliss’s famous lament for the privatization of history.³

The third explanation for misunderstanding is the amateur factor: the continual necessity for translation from one community to another in an irreducibly social world. Successful, mature science requires a certain community with shared standards for knowledge. Knowledge insiders like to talk to other knowledge insiders, engineers to other engineers. But the social, political, and economic payoff for knowing things requires wider conversations that are always a kind of translation, a thinking across different kinds of communities: between as well as amongst scientists and engineers, bureaucrats and politicians, capitalists and advertisers, lawyers and judges, and of course the wider public that was itself continually rearranging itself into specialized communities of workers or feminists or spiritualists or consumers and so forth. There’s almost certainly an expert of one sort or another at one end of the story and an amateur at the other. Historians partake of a little of both identities, they are insiders and outsiders simultaneously, in ways that some authors problematize more openly than others.

So what can we reasonably know and what should we reasonably debunk as historians and as Canadians? Above all, we see an argument for diversity, pluralism, and local and situated knowledge in preference to the abstractions of high modernity. That’s the kind of knowledge offered in this collection as well: “These chapters begin to locate the place of knowledge in Canada.... By establishing a handful of discrete data points, the authors contribute to the ongoing project of assembling a more coherent, if inevitably pointillist, history of these activities in modern Canada” (16).

That seems very sanguine. Knowledge that enjoins humility must, surely, do so humbly. Its authors, too, may misdiagnose their own certainties and the practical consequences of their work. I don’t see that humility here: there’s not much discussion of how history knows and what its knowledge owes to national priorities and opportunists. If we wish to scrutinize collective, professional standards of judgment, such scrutiny should, surely, extend to our own. It seems a little lopsided, for example, to see professional prizes listed in the biographies of the authors but never mentioned in the actual analyses of Canadian science.

Epistemological and political perplexities dovetail here. Consider an essay by historian Timothy Mitchell on area studies as applied to the Middle East. Mitchell notes that postwar modernization theory rested on broadly international social science and more place-based nation-state studies (largely modelled on the United States). But the social and political sciences “deterritorialized” themselves: they debunked area studies by arguing that globalization “transcended or cut at right angles” in a region like the Middle East, understood as a congeries of diverse places and peoples made more contingent by Edward Said’s erasure of the difference between the things known and the people knowing them.⁴ That’s no less true of Canada, another such congeries of diverse places and peoples made more contingent by the settler-colonial paradigm which performs that same act of erasure. But, Mitchell argues, in debunking place-based scholarship, the social sciences debunked their own certainties, which had always rested on a presumed “nation-state” place of convergence for economy, culture, state, and society. His solution is a “provincialization” of the social sciences: the kind of local and situated knowledge seen in *Made Modern*.

But how to connect the pointillist dots without appeal to the large-scale institutional-cultural constructs — “science” and “Canada” — that the book debunks? Notions of “fact” and “place” rely on one another: they resemble arteries and veins, connected by capillaries that turn the one into the other. You don’t get to posit the assembling of a “more coherent” picture without connective tissue, without appeal to something we *call* knowledge or community, “science” or “nation,” and the one is constitutive of the other. History doesn’t get a free pass as uniquely providing knowledge at once collective and objective. It’s not enough to win pointillist battles and to lose the major institutional-political wars, that is, to lose the collective mandate for better knowledge and policy. That’s why Bliss’s privatization concern still resonates. Bliss came to the privatization debate from research on medicine and politics, natural knowledge and public policy, that tried to distinguish better from worse forms. He put his knowledge towards greater national unity and was smartly informed that good knowledge was too specific and local to prop up national mythologies. Three decades later, the nation still totters on, as do science and technology as policy. But if we’ve learned anything, it’s that they are surprisingly vulnerable to concerted attacks by such interested parties as antivaxxers and major polluters, whose political victories that have driven the anthropologist Latour to apologetics and the political scientist Scott to anarchism.⁵ David Edgerton’s work on technology and the “rise and fall of the British nation” is instructive.⁶ Jones-Imhotep and Adcock urge a “synoptic view [that] can enhance our ability to steward the nonhuman world wisely” (12), but that’s not what *Made Modern* brings to the table. The fine scholars and illuminating essays gathered here might be the better for admitting that, if we want to use the word “we” for practical synoptic purposes, we are all, to some slight degree, become Michael Bliss.⁷

*Elsbeth Heaman teaches history in the Department of History and Classical Studies, McGill University. Her 2017 book, **Tax, Order, and Good Government**, won prizes from the Federation for the Humanities and Social Sciences and the Canadian Historical Association, including the Governor General's Prize for Scholarly History: The John A. Macdonald Prize.*

Endnotes

- 1 Robert N. Proctor and Londa Schiebinger, eds. *Agnotology: The Making and Unmaking of Ignorance* (Stanford: Stanford University Press, 2008).
- 2 James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1999).
- 3 Michael Bliss, "Privatizing the Mind: The Sundering of Canadian History, the Sundering of Canada," *Journal of Canadian Studies* 26, 4 (Winter 1991-2): 5-17.
- 4 Timothy Mitchell, "The Middle East in the Past and Future of Social Science," in *The Politics of Knowledge: Area Studies and the Disciplines*, David Szanton, ed. (Los Angeles: University of California Press, 2004): 74-118.
- 5 Bruno Latour, "Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern," *Critical Inquiry* 30, 2 (Winter 2004): 225-48; James C. Scott, *Against the Grain: A Deep History of the Earliest States* (New Haven: Yale University Press, 2017).
- 6 David Edgerton, *The Rise and Fall of the British Nation* (London: Penguin, 2018).
- 7 Thanks to Carmen Nielson for advice and the original prompt in regard to Michael Bliss: Carmen Nielson, "Canadian History Unsundered," *Canadian Historical Association Journal* (forthcoming 2020).

Space, made modern

Arn Keeling

The collection of essays in *Made Modern* generate useful and sometimes compelling insights into the role of science and technology in producing distinctly ‘Canadian’ experiences of modernity. Wide-ranging in focus and scope, the chapters nevertheless create a kind of composite image of Canadian modernity, understood as the effort to create new social and spatial orders oriented around and informed by science, technology, and (as James Hull points out in his chapter) an ideology of “efficiency.” Indeed, these essays remind us that it is not merely the existence of technological change or scientific advancement as much as it is the self-conscious experience and collective embrace (or rejection) of them that characterize the modern condition.

From the intimate spaces of the body (and, indeed, the ethereal) to urban technological networks to the large-scale transformation of the St. Lawrence Basin, science and technology have been deeply implicated in the modern re-ordering of Canadian society and environment. From a geographical perspective, *Made Modern* provides important perspectives into the spatial processes and transformations wrought through modern science and technology. The spaces, landscapes, and environments of Canadian technological modernity are sometimes at the forefront of these essays (for instance, those by Theodore, Kranakis, Bocking, Stein, and Macfarlane), while in other cases modernist spatial orderings and their ramifications are more implied than explicit. In this short commentary, I hope to highlight some of these historical geographies and their implications for understanding Canadian modernity.

Geographies of knowledge: A central concern of historians of science and of modernity has been the processes by which society and nature are “rendered technical” through the application of modern science, technology, and administrative systems. The goal of these interventions, James Scott argues in *Seeing Like a State*, has been to promote state power by creating “legible” social and natural orders, permitting their “efficient” management. These interventions are best understood, Tania Murray Li rightly suggests, as part of a broader ideology of “improvement” of society associated with modernist actors (including but beyond the state). Crucially, such schemes manifest as



1951 TCA Advertisement. Air Canada Collection, Canada Aviation and Space Museum, Ingenium. One of the figures reproduced in *Made Modern*.

particular reworkings of space and environment, whether through modernist urban planning schemes, rationalized agriculture, or the reconfiguration of ‘natural’ landscapes such as forests and rivers.

Similar themes and examples abound in the chapters of *Made Modern*. Sera-Shriar, Adcock, and Stuhl trace scientific efforts to incorporate unfamiliar and exotic Indigenous peoples and Northern territories into transnational networks of ethnographic and scientific knowledge, while simultaneously asserting the “Canadian-ness” of these regions. These efforts entailed both the systematic collection of “local” knowledge and the mobilization and circulation of such knowledge within wider scientific and administrative networks, “for Canada and for Science.” In bringing the geographies of knowledge production into focus, these accounts remind us, too, of the place- and field-based practices of certain knowledge domains (such as ethnography, geography, geology, and botany) and the practices of authority and credibility that accompanied scientific efforts to validate and systematize such local knowledge within particular centres of calculation.

Social order: as Li and Scott (somewhat differently) suggest, central to the modernist impulse is the desire to create and sustain rationalized biopolitical social orders. This impulse, Li and others note, extends beyond the state’s imperatives to maintain social control and exercise coercive power to encompass a wide range of actors, technologies, knowledges, and practices, ranging from the rise of political economy to census taking to public health initiatives—each informed by modern scientific practices of systematic data collection and calculation. Such interventions manifested at a variety of spaces and scales, from the body and the doctor’s office, to rural, urban, or even national populations. Indeed, scientific management of bodies, populations, and environments often helped produce particular kinds of spaces of order and control, such as the Indian reserve and urban “slum.”

Made Modern contains a number of insightful examples of such modernist social ordering. Emerging and contested scientific understandings of the modern body are explored by Gucciardo and Robertson in their accounts of electrotherapy and atomic theory, respectively. These examples evocatively show how putatively modern scientific theories and practices encountered and addressed the embodied experiences of modernity, in order to “improve” both individuals and societies. Similarly, Hadlaw’s chapter on the dial telephone explores how telephone companies’ implementation of this new technology required “configuring the user” in their individual interactions with both the telephone itself and the technosocial networks with which it connected. At a wider scale, Adcock illustrates how the “boundary work” of Canadian state efforts to regulate scientific and sporting activities in the Canadian north acted in important ways to define and produce the very categories of people and spaces the state sought to regulate. Kranakis’s compelling exploration of farmer Percy Schmeiser’s confrontation with Monsanto over Roundup Ready canola turns on the interconnection and contestation of a variety of spaces and

their associated orders and identities, from the lab and the canola field, to the very notion of what constituted farming under agricultural modernity.

Reconfiguring space and nature: some of the best-known accounts (and critiques) of modernity explore its radical transformations of both the experience and material qualities of space and nature. From David Harvey's notion of "time-space compression" to Alexander Wilson's exploration of the modernist "culture of nature" (and much, much other work besides), scholars link the ideologies of progress, modernity, and improvement with technological and scientific interventions that substantially reconfigure landscape and nature. Efforts to render the environment as "natural resources" and its transformation into an "organic machine" are typically derided as Promethean, authoritarian, and ultimately doomed to despoliation and failure. Indeed, the standard "declensionist narrative" of a good deal of environmental history reflects the ironic tale of attempted modernist reworkings of nature through technology, and their calamitous results.

The new landscapes and geographies of modernity traced in *Made Modern* share these critiques, but also reflect more complex and nuanced understandings of modernist interventions. Bocking's chapter, subtitled "modernity and disruption," offers a wide-ranging survey of modernity's territories, transformations, and disruptions associated with modern Canada's environmental history, and makes an excellent introduction to the section of the book on "environments." Stein's chapter on the "disruptive" technology of commercial aviation brilliantly illustrates how the advent (and marketing) of long-distance flight influenced long-held Canadian ideas about geography, seasonality, and identity. Macfarlane's exploration of the high-modernist St. Lawrence Seaway project perhaps best illustrates the links between the production of modern social and spatial orders. In reconfiguring the upper St. Lawrence as an industrial hydroelectric and navigation megaproject, Canadians (and their American partners) reimagined both the river and the nation as a space of improvement, efficiency, and control. That such interventions required the erasure of existing settlements and the radical (and problematic) simplification of the river itself, Macfarlane suggests, reveals the project as distinctively high modern, if lacking full coercive power suggested in Scott's conception.

If, as Jorgensen suggests in her epilogue, "Canada is an Anthropocene nation," it is perhaps worth additional consideration to what extent its history embodies the internal contradictions (both ideological and material) of both concepts, modernity and Anthropocene. If there is a shortcoming to the collection, it is in the slight attention paid to modernity's ideological obverse, antimodernism. Though there are certainly examples in these chapters of resistance and friction in individual and collective Canadian reactions to the rise of technological society, the persistence and articulation of critical and alternative visions of science and technology remain somewhat obscure. While the introduction usefully introduces both antimodernism and the idea of

“multiple modernities” as both historical and contemporary critical responses to high modernist ideologies, these concepts remain largely unexplored in the individual chapters (with the exceptions, perhaps of Kranakis and Bocking). Presumably antimodernism, too, entails actual and imagined spatial orders—“unimproved” environments and landscapes that perhaps act as spaces of resistance to modernism’s juggernaut.

*Arn Keeling is a professor of geography at Memorial University, specializing in the historical geography and contemporary legacies of extractive industries in the Canadian North. He is co-editor of **Mining and Communities in Northern Canada: History, Politics, and Memory**.*

The Canadian Modern

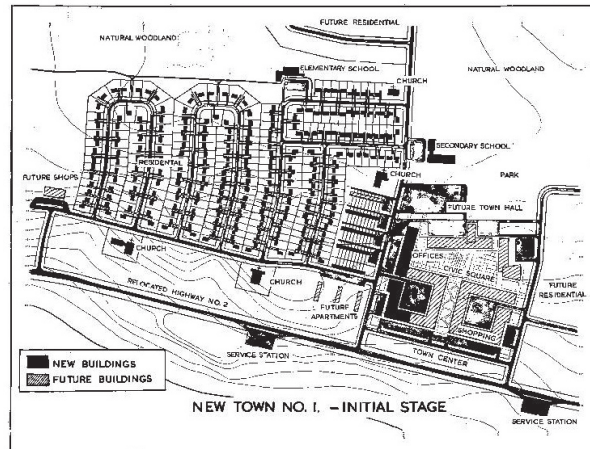
Sverker Sörlin

This book, drawn from a conference at York University, Toronto in 2015, does not try to tell a “story of diffusion from European origins” (4). It tries instead to talk about “relations” between knowledge, machines, materials, and cultural and social embeddedness. The editors, Edward Jones-Imhotep and Tina Adcock, with broad historical competencies in science, technology, and environment call this the lens of the “modern.” Certainly, nobody in our time and day, and certainly no serious historian, would argue that science and technology are *not* embedded in societies in multiple ways. But to say it is one thing, to demonstrate it in one single book through a collection of conference papers is another.

Canada’s modernity is marked by science and technology. This credo is repeated in several places in this book. Stephen Bocking claims in his chapter that his “colleagues in this volume” have asserted that science has become “central to the history of Canada” (251). His own contribution lies particularly in locating this centrality to a range of sites and spaces, often in the field where knowledge was produced with close relations to state ambitions and to extractive industries. His characterization of the other chapters is in my reading correct: that is an underlying shared assumption, often made explicit. Canada is presented throughout as a country of modernity, of technology, of reliance on science, of the applications of science, all central to its formation. It is probably also true, to the extent such a grand statement can be ‘true’.

After having read thirteen chapters agreeing to this overarching credo—and I say this with no irony—I am even more convinced than I was before that science, technology and modernity fit very well together in the Canadian experience. A question I have been pondering during my reading is rather another one: couldn’t the same book of science and modernity have been compiled for many nations? If so, how does the Canadian story relate to other countries who made the modern, or were made modern, or both? Aren’t science and technology conditioned by modernity, formative forces in it, and in criticizing it? If so, what is then special with ‘the Canadian modern’?

The editors’ introduction is an impressive review of the copious literature on modernity and modernization. A fundamental tension is introduced. On the one hand, Canada is the quintessential modern nation, with huge infrastructures, pronounced urbanization, an articulated and proud nation building, up-to-date and functioning health- and education systems, deeply enmeshed in global commerce and with a technologically advanced economy. On the other hand, Imhotep-Jones and Adcock wish their book to distance Canadian history of science and technology from diffusionist and universalizing stereotypes that used to be a common feature of colonial science. They rather suggest a relational history, of material artifacts, of “ambiguities, contradictions, and



Ontario Hydro blueprint. One of the figures reproduced in Made Modern. © Ontario Power Generation.

instabilities.”(4) The modernity that they grapple with is one where “meanings and experiences” are unsettled. The volume sets out to explore how science and technology have “formed the sites for Canadians to imagine, renounce, and reshape themselves as modern.” (4)

It is a book that also wants to address deep seated problems of the historiography of modern science and technology as triumphalist, Western-centric, and Euro-normalizing in that awkward old way that put most peoples in “the waiting room of history,” as Dipesh Chakrabarty famously noted in *Deprovincializing Europe* (2000), which is already a while ago. This remains a timely agenda, reflecting progress in these sub-disciplines over the last couple of decades, but also one that raises expectations. Perhaps also questions: what does it actually mean? Is it an attempt to tease out commonalities from a rich diversity, and thus to replace the conventional universalism with a new, different coherent narrative? Or does the collection suggest that no such coherence exists?

The York conference was held in honour of the US-born astronomer turned Canadian/historian Richard Jarrell (d. 2013 and a founder of this journal) who in the 1980s and 1990s suggested that Canada was vast and diverse, and important enough to be regarded as a national case in its own right. This included a “utilitarian focus” that may distinguish Canadian techno-science history from some of the standard European and US based ones—and not just sees it as a lesser version of these. Against this background the chapters in this book invite deep engagement with “the particularities of specific sites and localities.” They wish to “begin to locate the place of knowledge in Canada” (16). This grand ambition, given the vastness of the subject, is offered with an element of excuse; after all there isn’t very much research done, but someone must get this work started!

The chapters live up to stated ambitions very well, at least when it comes to site specificity. Several hone in on individual scientist biographies. Edward

Jones-Imhotep takes on Gerald Bull, whose checkered career as a ballistic and high altitude weapons constructor took him from Cold War military projects, via McGill's engineering department and private projects in the US, all the way to the unlikely role as collaborator with China, apartheid South Africa, and, ultimately, developer of Scud missiles and the Babylon "supergun" project for Saddam Hussein's regime, a step too far for which Bull was ultimately assassinated, likely by Mossad agents. Jones-Imhotep calls it "an anti-case study" in the spirit of Jarrell's search for counternarratives. Quite at the other end of the spectrum, David Theodore explores the career of Christopher Thomson, a physicist with New Zealand roots who pursued computerized analysis in the Montreal Neurological Institute in the early 1970s. His machinery was modest indeed, but his personal skills were vast. Theodore's analysis revolves around the concept of "trained acquaintance" (171), coined by Norbert Wiener in *Cybernetics* (1948). Wiener thought of a small-scale version of interdisciplinarity, literally embodied in one person or a small team, where each member knew just enough of the others' expertise to function together. Theodore calls this "small science", in contrast to big science and mega-size teams such as the Manhattan project or the CERN accelerator in Geneva. But also to suggest a possible small history, in contrast to what Bruce Hevly once called "big history"—in his afterword to a book he co-edited with Peter Galison, *Big Science: The Growth of Large-Scale Research* (1992)—a strand of history writing that since then has had a fabulous career along several trajectories.

Other cases of smallness, or marginality, in this volume are found in chapters on medical and ethnographic practices. Being modern could also mean to deviate, appropriate normal science and tweak it for popular digestion or sectarian pursuits. Dorotea Gucciardo takes a close look at how new knowledge of the role of electric signals in the human body travelled quickly in the late 19th century to medical and psychiatric clinics, rather than to the big hospitals and medical research centers. The body could in the intimacy of a closer doctor-patient relation be regarded as "a battery" (86) and electrotherapy was suggested as a cure for anything from neurasthenia to hysteria. A few decades later a small group of believers in Kitchener-Waterloo became convinced that "cosmic rays", Robert Millikan's concept from 1925, could indeed have a healing effect, as Beth A. Robertson explains. These magic rays could gracefully rejuvenate and perfect the human body through its own "atomic content" (115), shared by everyone, claimed Thomas Lacey, a semi-famous medium and peace prophet who led the Kitchener-Waterloo atomic spiritualists in this personalized version of 'atoms for peace' *avant le mot*. New technology could also mobilize ordinary citizens, as Jan Hadlaw explains in an entertaining chapter on the "mysteries" of the Bell rotary telephone, introduced in the late 1920s, in fact taking away some intimacies that had been there with the switchboard girls, and some of their extra services too, like giving the time and chatting for a second.

These papers are very true to Richard Jarrell's ambition to turn Canadian history of science away from "great men" and "pure science" (105), and here it

really pays off. They also bring the social, even vernacular dimensions of the circulation of science and technology close to the fore. “Canadians”, a word that often appears throughout the volume, here also gets flesh, blood, and even names. However, just as Cold War oddballs were a numerous species and small collaborative and computerized teams were quite normal in any country in the 1970s, not much of these vernacular medical and communication histories comes across as Canadian. Pseudo-scientific spiritism was everywhere, electrotherapies, too, not to speak of dial telephones.

Efraim Sera-Shriar presents British physician Richard King’s 1830s ethnographic travels in Arctic British Canada. He fits the pattern of an expedition scientist, pursuing a marginal and small-scale project, although his work style was common in colonial expeditions around the world, and with considerable consequences as his ideas were living on institutionally in the Ethnological Society of London, which he cofounded. King was just an unusually sensitive and sympathetic fieldworker, with empathy, fairness and an eye for indigenous virtues and suffering, but structurally and functionally just as imbued with racist conceptions as most others. Expeditions, of which we encounter several in this volume, were always political and a chief means of claiming sovereignty in the north and therefore restricted for foreigners. When almost a century later American explorer G. P. Putnam gets access to the Eastern Canadian Arctic, twice in 1926 and 1927, it turns out his field practice was more that of a sinister bird hunter than that of a scientist, causing a minor crisis. Making astute observations about the floating and broad skill sets of northern scientists, Tina Adcock shows how the Putnam incident reflects a common pattern. Both institutional and self-proclaimed field scientists often were, also, intrepid hunters, they picked up local knowledge, they collected intelligence, in essence carried a versatile if sometimes dangerous expertise. In response to Putnam’s transgressions Canadian scientists and public officials enacted “boundary work” in Thomas Gieryn’s sense, to defend their expertise turf but also their nation.

These are excellent case studies of historical realities that may in some sense be very Canadian, insofar as they touched upon sensitive geopolitical and power relations, to the British in the 1840s, and to the Americans in 1920s. They enrich our knowledge about the social function of field science, expertise, science-policy relations, and about Canadian history in ways that would have made Jarrell proud. But they have fairly little to say about ‘the modern’, more than the obvious, that these are the kinds of processes we should expect as societies modernize, not just in Canada.

That said, it should be acknowledged that the large majority of chapters—more than I can cover here—offer distinct and invariably entertaining and well-written insights into modern Canadian history, sometimes from fresh and novel angles, such as air travel. Canadians feared flying in the wintertime, despite the fact that harsh winters were the basis for Confederation era boosterism—according to Carl Berger’s essay “The true north strong and free” in Elspeth

Cameron's collection *Canadian Culture* (1997). As Blair Stein explains in *Made Modern*, technology could take that fear away, with cabin pressurization and luxury on board. Hence, being Canadian was not just to endure the cold but, on the contrary, to be able to overcome anxieties by means of technology, and at the same time conquer the vast distances that were a hallmark of the nation—the land of “too much geography” in Mackenzie King's famous phrase—and do it in all seasons.

Eda Kranakis writes about Monsanto and the prairies in ways that make us see high-modernity agriculture as an arena of gene-patent rights. Andrew Stuhl returns to Vilhjalmur Stefansson's iconic, and infamous, Canadian Arctic Expedition (1913-1918), at the same time a national trauma and triumph. He uses the multivolume *Report* of the expedition (1919-1926) to reflect on what kind of work the expedition actually did. Applying James Secord's circulation concept, he refers especially to work by Lissa Roberts in order to seek the deeper significance of the *Report* and finds it to be a much more complex and wide-reaching object than previous historiography rendered it. It was widely distributed to libraries, institutions, and key scientists, and it worked meticulously to “project intellectual authority over the Arctic” (294), serving as an instrument of what Janice Cavell and J. D. Noakes called “Acts of Occupation” (2010).

Gene-tech prairies, Stephen Bocking's scientific landscapes, and the geopolitical significance of expeditions are chapters grouped into an “environment” section. They provide materials that may be used if one wanted to draw up a more specifically Canadian modern history of science and technology. Perhaps this is precisely because these chapters are not just situated, in the lab, clinic, or government office. The landscape/environment scale is large enough, and ‘geographical’ enough to make it non-replicable, although of course similar processes happened elsewhere, in Russia, Alaska, and Scandinavia.

It could have been useful to supplement the national focus with a more articulated comparative approach. The editors spare no effort in assuring readers that Canadian technoscience was always transnational and to analyse relations between objects, models, methods, and bodies is a good way to connect dots and bring structure to diversity. However, after having pondered carefully on the collective effect of all chapters, each with a strong and valid point of view—and some truly excellent—my initial reaction does not go away. The Canadian experience of science and technology does share similarities with many countries with vast territories, rich resources, often an OECD membership, and in some cases also one of NATO. Such countries typically organize, with some variations of course, strong institutional approaches to their national resources, such as CSIRO in Australia, the US Geological Survey, the Geological Institute of Denmark, the large resource-oriented public agencies of Sweden, or museums and their expertise in almost every country.

Institutions get little attention in this volume and I don't think it would have violated Richard Jarrell's program if they had. It could have helped build a more consistent pattern out of the search for diversity and detail that he has apparently inspired. Because, after all, despite the merits of the individual contributions, it is hard to see what is so deeply Canadian with them. Many countries have an airline, military research, and built oil rigs (completely absent in this volume, just as forests are) and huge hydro-electric dams. In most there were also markets for spiritualist applications of physics and ectoplasma. At least in some countries there are vast hinterlands rich on resources where "landscapes of science" took shape with research stations and bodily practices and elaborate acts of occupation. Were all these nations also "made modern"? The editors don't say it explicitly, but there is an, albeit timid, exceptionalist assumption underpinning the volume that I will not confront. But I would have liked them and their chapter authors to engage with it more actively. Argue it, question it. What is so very, very modern with science and technology in Canada, after all?

It is possibly the temptation of any edited collection to somewhat overstate its case. That may not be such a bad thing either. There is a virtue in pushing your argument to make an imprint. And it's true that a patchier, more marginal and site-specific character of science and technology is now the norm rather than the exception. Technoscience micro-narratives abound. Sooner or later they will feed broader insights. The importance of figures like Jarrell, and now of this collection, is also that: to give us the infinite detail of the modern experience. It has been progressive, path breaking, and necessary to make sense of what goes on in nations and regions of all shapes and sizes. But there is also a time for what Charles Tilly called *Big Issues, Large Structures, Huge Comparisons*, in a book by that wonderful title in 1984. Telling from this generous and well-crafted volume Canada has a lot to offer in such work.

*Sverker Sörlin is Professor of Environmental History and co-founder of the Environmental Humanities Laboratory at the KTH Royal Institute of Technology, Stockholm. He specializes in Arctic and Canadian science, environment and policy and was recently a fellow of the Peter Wall Institute for Advanced Study at UBC. Recent books in English include, **The Environment – a History of the Idea** (co-authored with Libby Robin and Paul Warde; Johns Hopkins 2018) and **Grounding Urban Natures: Histories and Futures of Urban Ecologies** (co-edited with Henrik Ernstson; MIT Press 2019). He serves on editorial advisory boards of **The Anthropocene Review** (SAGE), **Environmental Humanities** (Duke), and **Environment and Planning E: Nature and Space** (SAGE), and is a prize-winning author of narrative non-fiction, essays, biographies, journalism, and scripts for television and film.*