

# Land surveying: An institution that has shaped Canada

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## Under a spell

As Nina Simone suggested, let me put a spell on you by describing how land surveying has shaped Canada. The spell focuses on surveying as an institution, using a cunning mélange of infrastructure, innovation, ideas, ideals, individuals, imagination and Indigenous lands.<sup>1</sup> 'Cause here's the thing: **Surveying defines Canada.**

The spell **largely** ignores<sup>2</sup> Champlain, Radisson, Groseilliers, Holland, Thompson, Fidler, Pond, Hearne, Mackenzie, Palliser, Rae, Dennis, Moberly, Weaver, Deville and their ilk, for a bunch of reasons. Many of them were courier de bois, fur traders, explorers and mappers; not land surveyors.<sup>3</sup> They have been much celebrated elsewhere.<sup>4</sup> And; focusing **solely** on individuals runs the risk of discounting surveying as an institution. The spell also ignores survey systems, which are also described elsewhere:<sup>5</sup>

This spell-binding chat is structured in three parts:

- Embedding surveying as part of Canada's psyche;
- Regaling with 10 colourful vignettes;
- Speculating about future contributions.

From here on, the term "surveyors" means both "land surveyors" and "arpenteurs-géomètres." Similarly, "surveying" means the parcel/boundary work that has been done by surveyors over these many years, and that continues. The goal is to get all up in your grill:<sup>6</sup> To show that, as each fardel of land was demarcated, surveying became part of the fabric - the very warp and weft - of Canada.<sup>7</sup>

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<sup>1</sup> I to the 7<sup>th</sup> as it were.

<sup>2</sup> Nor are colonization roads, watercourses as highways, the internet of things, geo-referencing road networks, pipeline rights-of way, subdivisions, Lenin's dialectical materialism or Kant's categorical imperative discussed.

<sup>3</sup> For instance, Champlain surveyed the St Lawrence River; Palliser surveyed valleys, coal deposits, forests; Rae surveyed the telegraph route: Castonguy. Geographical imaginations of the St Lawrence River. *The Canadian Geographer*. v60-n4. p427. 2016. Newman. *Caesars of the wilderness*. Viking. pp 367 & 371. 1987.

<sup>4</sup> Thomson. *Men and Meridians*. Minister of Supply & Services Canada. 1966-69. Rogers. History of the Surveyor General Branch. Chapter 2 in: Ballantyne, et al. *Surveys, parcels and tenure on Canada Lands*. SGB- NRCan. 2010.

<sup>5</sup> Weaver. *Crown surveys in Ontario*. Department of Lands & Forests. 1968. Taylor. *BC Crown lands: A history of survey systems*. Ministry of Sustainable Resource Management. 1975. MacGregor. *Vision of an ordered land*. Western Producer Books. 1981. McKercher & Wolfe. *Understanding Canada's Dominion Land Survey System*. Univ of Saskatchewan. 1986.

<sup>6</sup> To get up in your bidness.

<sup>7</sup> If two fardels = nook, and four nooks = yard-land, and yard-land = 50 acres, then fardel = 6.3 acres. Noy or Wharton. [dictionary.thelaw.com](http://dictionary.thelaw.com)

## Part 1 – Surveying as part of Canada’s psyche

### A higher standard of intelligence

Let’s start with a few general observations about Canadian surveyors:

- MacGregor, who wrote *Vision of an ordered land*, called you: “highly intelligent men [and women] who are gifted astronomically, mathematically, and logarithmically.”<sup>8</sup>
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- In 1928, surveyor Hossie noted that: “As professionals you are expected to exhibit a higher standard of intelligence than the person on the street.”<sup>9</sup>

The latter observation, from the BCLS – AGM, echoed across Alberta in the 1950s, within the federal government in the 1960s, and through the courts recently. Courts in Québec, in Prince Edward Island and in British Columbia have recognized that:

- “The surveyor has been assigned a particular role by legislation [with] but one mandate: Enlightening the court ... bound by the fundamental rules of natural justice.”<sup>10</sup>
- “A surveyor acts in a quasi-judicial capacity ... is treated as an expert and accorded deference ... A land surveyor is acting in the capacity of an officer of the state.”<sup>11</sup>
- “Surveyors adjudicate ... Surveyors must approach their work with a judicial mind ... Their primary duty of impartiality [is] owed to society at large.”<sup>12</sup>

These are not merely platitudes, props or big-ups. Rather, they characterize surveying as an institution.

### Doin’ alright - Institutions matter

Institutions matter and Canadian faith in institutions is high. As early as 1867 – when the provinces of Nova Scotia, New Brunswick, Québec and Ontario came together to form Canada - institutions were the subject of debate in the House of Commons.<sup>13</sup> The Honorable Mr Langevin observed that: “French Canadians always fought for their institutions, their rights, their language ... we must respect everybody’s rights as we have done for our seigneuries.”<sup>14</sup>

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<sup>8</sup> MacGregor. *Vision of an ordered land*. Western Producer Books. px. 1981.

<sup>9</sup> Hossie (1928) quoted by Holloway (1952). In: *Legal principles & practice of land surveying: A series of 12 papers covering various aspects of cadastral surveying*. Department of Mines & Technical Surveys. 1961.

<sup>10</sup> *Ruest v Groupe Gestion 2000 Inc*, [1997] RDI(CS) 239 (as translated by Daniel).

<sup>11</sup> *Mackay v Mackenzie*, 2016 PECA 16.

<sup>12</sup> *Burke v Watson & Barnard (a firm)*, 2016 BCCA 439.

<sup>13</sup> Section 146 of the *Constitution Act, 1867* allowed for the future admission of the North-Western Territory and Rupert’s Land (once the fiefdom of the Hudson’s Bay Company) into Canada.

<sup>14</sup> Commons Debates, p194, December 5, 1867. In: *R v Caron*, 2009 ABQB 745, at para 53.

This trend – of trusting Canadian institutions - has been constant for 150 years. In 2013, the *Survey on Social Identity* revealed that most Canadians have some or much confidence in institutions:<sup>15</sup>

- Police (76%);
- School systems (61%);
- Banks (59%); and
- Justice system/courts (57%).

Canadians' average confidence in seven key institutions is 50%.

Lest you think that these values are low, let's compare such institutional confidence with the United States. American's average confidence in 14 institutions is only 32% (note that the sampling was done in mid-2016, before the recent election).<sup>16</sup> Indeed, since 1992, American average confidence has **never** risen above 43%. To compare like to like, American confidence is low in:

- Justice system (23%),
- Supreme Court (36%), and
- Congress (a mere 9%).

So, Canadian institutions are doin' alright.<sup>17</sup> There is a sad oversight, of course: Surveying should be one of the institutions being measured. I feel your pain. What say we demonstrate the significance of surveying using work volumes, frequency of phrasing, and the economic value of employment?

- In 2015, surveyors in Québec, in Ontario and on Canada Lands registered 25,000 survey plans.
- Over the period 1867 to 2008 (almost the full 150 years):
  - o "Land surveying" was used once in every 200,000 words in English publications, with peak usage in 1890, 1910, 1925, 1960 and 1970.
  - o "Arpenteurs-Géomètres" was used twice as much – once in every 100,000 words in French publications, with peak usage in 1900, 1960, and 1975.<sup>18</sup>
- In a 2011 study, Canadian surveyors made bank:
  - o Median income ranged from \$81,000 (salary) to \$105,000 (self-employed).<sup>19</sup>

To put these amounts in stark contrast – income over \$80,000 put surveyors in the top 10% of all Canadians; the median individual income across Canada was \$34,000.<sup>20</sup>

The robustness of Canadian institutions such as surveying (including self-regulating associations, parcel fabric, jurisdictional boundaries, subdivision processes, and so on) is reflected in how Canada links

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<sup>15</sup> Although confidence in the media (40%), Parliament (38%) and major corporations (30%) was less stellar, there is good news: Parliament is trusted by 50% of young people (aged 25-34), 56% of visible minorities, and 65% of recent immigrants. In: Cotter. *Public confidence in Canadian institutions*. Statistics Canada. December 2015.

<sup>16</sup> Norman. *Americans' confidence in institutions stays low*. Gallup. June 13, 2016.

<sup>17</sup> I am unsure as to how Canada compares to New Zealand, to Finland or to Burkina Faso.

<sup>18</sup> Using Google's *Ngram Viewer*, which measures how often a phrase is used in literature - English or French.

<sup>19</sup> Framework Partners Incorporated. *Findings from the 2011 PSC national compensation survey*. January 15, 2012.

<sup>20</sup> StatsCan. Education and occupation of high-income Canadians. 2011 Census.

economic prosperity with social progress. Canada ranks second in the world (out of 133 countries), according to the 2016 *Social Progress Index*.<sup>21</sup> Canada was first in 14 indicators, including access to and ease of use of property (freehold, condominium/strata, co-operative, open access, and common property). On the other hand, Canada's cell phone usage sucks. We ranked 102<sup>nd</sup> - only 81% of Canadians own a cell phone.<sup>22</sup>

### Avoiding a store of mischievous litigation

Part of the reason for the influence of surveying is that Canada – from its early days – focused on land rather than on people. In 1875, *The Nation* wrote:

“Here we are; rooted to the soil ... **This** feeling constitutes **nationality**. We recognize ourselves as belonging to the land ... as borrowing from it a name and a position in the world.”<sup>23</sup>

As early as 1763, the *Royal Proclamation* explicitly recognized the link between surveys and the land. In acknowledging that it was “just and reasonable” that Indigenous peoples should not be molested or disturbed in their possession of land, Canada<sup>24</sup> could not “grant warrants of Survey” beyond “the Bounds of their ... Government;” or indeed upon any lands which had not been ceded to or purchased by the Crown.<sup>25</sup>

The influence of surveying has been a constant refrain. Twelve years later, in 1775, the Crown instructions to Governor Carleton set out that “all Tracts” of land legitimately purchased from Indigenous peoples “shall be regularly surveyed by a Sworn Surveyor in the presence and with the assistance of a [First Nation] Person deputized to attend such Survey.” The plan (or map) of survey which described the boundaries of the parcel was then to be recorded with the Crown.<sup>26</sup>

In 1839, the Earl of Durham suggested reforms to the two Canadas (Upper and Lower). Much of his report is devoted to the role of surveying. If land “is so carelessly surveyed that the boundaries of property are incorrectly or inadequately defined” there is “a store of mischievous litigation for the people.”<sup>27</sup> Surveys were accepted as integral to reform:

“I have already pointed out the importance of accurate surveys of the public lands. Without these there can be no security of property in land, no certainty even as to the position of boundaries marked out in maps or named in title deeds.”<sup>28</sup>

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<sup>21</sup> Cecco. Social progress index. *The Globe and Mail*. June 29, 2016.

<sup>22</sup> Canada also ranks poorly on environmental quality and obesity.

<sup>23</sup> Zeller. *Inventing Canada: Early Victorian science & the idea of a nation*. McGill-Queens Univ Press. p111. 2009.

<sup>24</sup> Actually, Québec.

<sup>25</sup> In: Patterson. *Land settlement in Upper Canada, 1783-1840*. Ontario Archives 1920. p219. 1921.

<sup>26</sup> In: Patterson. *Land settlement in Upper Canada, 1783-1840*. Ontario Archives 1920. p220. 1921.

<sup>27</sup> *The Report & Despatches of the Earl of Durham, Her Majesty's High Commissioner and Governor General of British North America*. p145. 1839.

<sup>28</sup> *The Report & Despatches of the Earl of Durham, Her Majesty's High Commissioner and Governor General of British North America*. p166. 1839.

In 1869 in Manitoba, surveyor Dennis Sr advised the Minister of Public Works that “a considerable degree of irritation exists ... in view of surveys being made without the Indian title having been first extinguished.”<sup>29</sup> In 1873, the First Nations at Fort Ellice, Saskatchewan petitioned to stop surveys until their land issues were resolved.<sup>30</sup> At the Treaty ceremony the following year, federal government officials were lambasted for allowing surveys to proceed before Aboriginal title had been addressed.<sup>31</sup>

### **The boundless continuity of the shade<sup>32</sup>**

And here we have an early hint of the role of surveying in reconciliation – as an institution that links all peoples with the land. For, any discussion of land tenure in Canada must acknowledge that Indigenous peoples knew parcels and boundaries.<sup>33</sup> The very word “canada,” of course, refers to a large parcel, the bread and butter of surveying. In the Laurentian language<sup>34</sup> in the 16<sup>th</sup> century, “canada” meant village, settlement, land, town, cluster of dwellings, or collection of huts. Kanata means town in Mohawk. Cartier, in narrating his voyages of 1535/1536, labeled the larger territory of the St Lawrence valley “le pays de Canada” (land of canadas or land of villages).<sup>35</sup>

In 1631, European arrivals noted with admiration that Indigenous peoples:

“Were very exact and punctual in the bounds of their lands ... I have known them to make bargain and sale amongst themselves for a small piece of land.”<sup>36</sup>

Soon thereafter, the Innu of Québec demarcated trapping parcels of four square leagues (32 sq km). Blazed trees bounded each band’s property rights and discouraged trespass. Parcels and boundaries became institutionalized in response to changing conditions – demand for fur-bearing animals.<sup>37</sup>

By 1764, First Nations were “perfectly well acquainted with their exact original boundaries ... divided and subdivided.”<sup>38</sup> As Joseph Brant led the Six Nations from the United States into Upper Canada, the community understood fee simple, leases, severances, sales/transfers; and advocated for a registry of their rights in land.<sup>39</sup> The parcel that the Whitefish Lake First Nation reserved for themselves in the 1850 *Robinson-Huron Treaty* was clearly defined using nine monuments known to the community: From a lake known as “the place of high cranberries,” to Keecheemenessing (“Great Island”), to “an island

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<sup>29</sup> Dennis Sr, 1869. In: MacGregor. *Vision of an ordered land*. Western Producer Prairie Books. p3. 1981.

<sup>30</sup> “They would sometimes express their resentment by defecating upon the top of every survey stake, which added nothing to the amenities of the job.” In: Shaw. *Tales of a pioneer surveyor*. p105. 1970.

<sup>31</sup> Indigenous peoples were puzzled as to how the Hudson’s Bay Company parcel was sold for 300,000 pounds to Canada, without the Indigenous peoples getting any revenue. In: Daschuk. *Clearing the plains: disease, politics and the loss of Aboriginal life*. Univ of Regina Press. p95. 2013.

<sup>32</sup> Riley. *The once and future Great Lakes country: An ecological history*. McGill-Queens Univ Press. p178. 2013.

<sup>33</sup> Ballantyne. Aboriginal title: Bounds & parcels of Aboriginal lands in Canada and Norway. Chapter in: Battarbee & Fossum (eds). *The Arctic contested*. PIE Peter Lang. p217. 2014.

<sup>34</sup> An Iroquoian language spoken in the St Lawrence Valley in the 1500’s.

<sup>35</sup> Bref Recit et Succincte Narration de la Navigation faite en MDXXV et MDXXXVI par le Capitaine Jacques Cartier aux Iles de Canada, Hochlega, Saguenay at autres. Paris Librairie Tross. 1863.

<sup>36</sup> Riley. *The once and future Great Lakes country: An ecological history*. McGill-Queens Univ Press. p48. 2013.

<sup>37</sup> Demsetz. Towards a theory of property rights. *The American Economic Review*. v57-n2. p347. 1967.

<sup>38</sup> Riley. *The once and future Great Lakes country: An ecological history*. McGill-Queens Univ Press. p62. 2013.

<sup>39</sup> Riley. *The once and future Great Lakes country: An ecological history*. McGill-Queens Univ Press. p77. 2013.

where there stands a tree having a spreading top” and so on.<sup>40</sup> In 1951, it was noted that: “[First Nations] have certain ways of doing things ... in dealing among themselves regarding property, land, etc. ... it is surprising how well their unbelievable methods work”<sup>41</sup>

### Some trite stuff

It goes without saying that socio-economic development is a function of parcel-based property rights.<sup>42</sup> After all, “trespass” refers to crossing a boundary. This reflects the innate territoriality of humans as a species and is shown in some of the first laws ever written. By 4,000 years ago, the Sumerians of Mesopotamia (literally, between the two rivers – the Tigris and the Euphrates) legislated that those “who violated the boundary shall give one sheep, 10 loaves and one jug of beer” and ... “reconsecrate<sup>43</sup> the parcel.”<sup>44</sup>

What is less obvious is the extent to which land tenure has influenced the development of Canada. Inequitable policies in Québec led to Papineau’s 92 resolutions in 1834;<sup>45</sup> Ontario’s clergy reserves spurred the rebellion of 1837;<sup>46</sup> tenure reform in Québec led to a Seigniorial Commission in 1843;<sup>47</sup> Prince Edward Island rejected Confederation in 1867 owing to the influence of absentee landlords; Ontario’s westward expansion led to the 1870 brouhaha in the Red River settlement; British Columbia’s entry into Canada in 1871 was predicated on building a railway; the Mackenzie Valley pipeline was deferred in 1975 until rights in land were confirmed; the Nunavut-NWT boundary was recently surveyed so as to provide certainty to mining claims, and so on.

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<sup>40</sup> *AG Ontario v Francis, et al*, ON HC, January 19, 1889: PAO, Aemilius Irving Papers, Box 42, file 42, item 9.

<sup>41</sup> Ball letter to Glen. January 30, 1946. Courtesy of Steve.

<sup>42</sup> Flanagan. *Why First Nations succeed*. Fraser Institute. November 2016.

<sup>43</sup> Perhaps consecration mimicked the Polynesian navigator’s technique of “dragging his testicles” on the hull of the canoe to feel the vibrations of waves and currents. In: Milner. *Pinpoint. How gps is changing technology, culture and our minds*. Norton. p14. 2016.

<sup>44</sup> Ellickson & Thorland. Ancient land law: Mesopotamia, Egypt, Israel. 71 *Chi-Kent LR* 321, at 343. 1995

<sup>45</sup> Herstein, et al. *Challenge & survival: The history of Canada*. pp 166 & 170. 1970.

<sup>46</sup> By 1837, 264,000 ac of land in Upper and Lower Canada had been granted to persons contracted to survey (i.e. to surveyors). Dysfunction, corruption and favoritism within the Upper Canada Surveyor General’s office was rife.

<sup>47</sup> Johnson. Towards a reconstitution of property in mid-19<sup>th</sup> century Québec. *McGill Law Journal*. v32. p636. 1987.

## Part 2 – 10 colourful vignettes

It's a bold assertion that surveying pervades Canada's psyche. Let's substantiate the assertion with 10 vignettes, in chronological order.

### Vignette 1: Sometimes, inferior survey equipment rocks

The boundary between Canada and the United States has been described as "inconvenient to the point of freakishness."<sup>48</sup> Negotiation and compromise underpinned the first survey of the boundary in 1766, along the 45<sup>th</sup> parallel of latitude.<sup>49</sup> The 45<sup>th</sup> as boundary owed its genesis to 1614, when the New Netherlands Company was granted a three-year monopoly to trade between the 40<sup>th</sup> and 45<sup>th</sup> parallels, south of New France (Québec) and north of Virginia. In 1664, New Netherlands had morphed into the Province of New York, which also had the 45<sup>th</sup> as its northerly boundary. In 1763, the *Royal Proclamation* set out that the southerly boundary of Québec was "in 45 degrees of north latitude."<sup>50</sup>

In 1766, Governor Moore of New York and Lieutenant Governor Carleton of Québec set out for Lake Champlain. They were accompanied, respectively, by Harpur, professor of mathematics for New York and by Collins, Deputy Surveyor General of Québec. Harpur surveyed the 45<sup>th</sup> parallel just south of Ilse a la Motte; Collins surveyed the 45<sup>th</sup> parallel through the north part of Missiskoui Bay. Sadly, the two demarcations were five miles apart. We now know that Collin's line was north of the 45<sup>th</sup> and Harpur's line was south of the 45<sup>th</sup>. Each surveyor had established his provincial parcel **smaller** than the other's parcel, a scenario that "is perhaps unique in the history of boundary disputes."<sup>51</sup>

The two surveyors compromised by establishing a final monument midway between the initial lines.<sup>52</sup> The negotiated compromise was a function of technology and technique<sup>53</sup> and of limited redundancy. It established the monument that served as the starting point for the entire 250 km survey of the Québec-New York and Québec-Vermont boundary between 1771 and 1774.<sup>54</sup> The demarcated line deviated significantly from the 45<sup>th</sup> parallel by as much as 1.9 km, favouring the United States by 170 sq km. Nevertheless, the *Webster-Ashburton Treaty* of 1842 sanctioned the monumented line as the boundary.

### Vignette 2: Drama queen

In 1783, after the upheaval of the American Revolution, the United States asked Britain to make a voluntary offer of Canada as a conciliatory gesture. To paraphrase the American negotiators of the day: "We won. We want the large parcel to the north. So, give us Canada and we're good!" Although Britain resisted the request, the boundaries of the resulting *Treaty of 1783* appalled Governor Haldimand:

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<sup>48</sup> Jones. The Cordilleran section of the Canada-US borderland. *Geographical Journal*. v89-n1. p349. May 1937.

<sup>49</sup> Although Collins might have surveyed part of the boundary in 1765: PAO. RG 1-1, v2, p44, MS 7422. Suggested by: Ladell. *They left their mark*. p56. 1993.

<sup>50</sup> This recognized that the colonies of Québec and New York were both under British jurisdiction.

<sup>51</sup> Mayo. The forty-fifth parallel: A detail of the unguarded boundary. *Geographical Review*. v13-n2. P258. 1923.

<sup>52</sup> McEwen. The Collins-Valentine boundary. *Geomatica*. v51-n2. p174. 1997.

<sup>53</sup> Although Collin's instrument was somehow superior to Harpur's instrument, Harpur's location was more accurate (i.e. closer to the 45<sup>th</sup>) than Collin's location.

<sup>54</sup> Pratt. *Report of the Regents of the University on the Boundaries of the State of New York*. vii. 1884.

“My soul is completely bowed down with **grief** ... we have **humbled** ourselves so much as to accept such **humiliating** boundaries.”<sup>55</sup>

Of course, back in the day, Haldimand was a bit of a drama queen.<sup>56</sup>

### Vignette 3: Napoleonic pretensions

It goes without saying that the Hudson’s Bay Company (HBC) is an institution that shaped Canada;<sup>57</sup> and that George Simpson – as Governor – shaped the HBC.<sup>58</sup> But what of the boundary dispute that shaped Simpson?<sup>59</sup> In 1820, while still a junior employee, Simpson was stationed for the winter at Fort Wedderburn on Lake Athabasca in north-eastern Alberta. The Northwest Company built a small blockhouse a mere **12 m** away on Potato Island, so as to observe the comings and goings at the HBC fort. The HBC demarcated a boundary first, establishing a fence mid-way between the two buildings. The NWC disagreed with location of the fence. On October 19, 1820 the NWC attempted to establish its own fence **60 cm** closer to the HBC building (really, a second demarcation of the boundary).<sup>60</sup>

The second demarcation vexed the HBC. On October 23; they arrested the fence-builder – Simon McGillivray Jr. These series of incidents – the need to establish a boundary, the absence of surveyor, no sanctioning of the first demarcation, dispute between the first and second runnings of the line – weighed heavily on Simpson. He admitted in his diary that: “I have my private doubts as to the legality” of the arrest. You can **well imagine** the effect that this boundary dispute had on George Simpson, on the subsequent merger between the two rival fur-trading companies, and on the Company’s influence on the development of much of Canada.<sup>61</sup>

### Vignette 4: Royal Canadian Institute & the Time-Lord

In 1849, a few surveyors in Ontario decided “to organize a society for the better improvement of surveyors, in order that much ... litigation ... may be prevented.”<sup>62</sup> The first meeting took place on June 20, 1849 in an office at King and Yonge Streets in Toronto with the purpose of uniting three professions – land surveyors, architects and civil engineers. By September 1849, surveyor Rankin was Vice-President, surveyor Dennis Sr was Secretary, and surveyor Fleming was on the Standing Committee. By April 1850, Rankin had assumed the Presidency. The “prospects of the young Institute were not brilliant” at that time – the meeting of February 8, 1850 drew only two people. Nevertheless, the Institute forged ahead, by:

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<sup>55</sup> Riley. *The once and future Great Lakes country: An ecological history*. McGill-Queens Univ Press. p68. 2013.

<sup>56</sup> As identified by Steve.

<sup>57</sup> As Canada expanded west after 1867, the HBC received 45,000 ac of land at its 120 fur-trading forts and another 7,000,000 ac throughout the DLS system.

<sup>58</sup> “He ... lived up to his own Napoleonic pretensions”: Newman. *Caesars of the wilderness*. Viking. p219. 1987.

<sup>59</sup> At the third level of *Inception*-like influence.

<sup>60</sup> Newman. *Caesars of the wilderness*. Viking. p199. 1987.

<sup>61</sup> *Journal of the occurrences in the Athabasca Department by George Simpson, 1820 & 1821 and Report*. Champlain Society & the Hudson’s Bay Record Society. 1938.

<sup>62</sup> Fleming. *The early days of the Canadian Institute*. 1900.



- Debating legislation for regulating the admission of surveyors and the survey of lands throughout the province; and
- Discussing topics such as accretion in Toronto harbor.

In 1851, the Institute expanded to admit a range of learned people, ending its professional and exclusive character. This expansion outraged some original members, who resigned in protest. Yet, the Royal Canadian Institute thrives today: It envisions a scientifically-literate Canadian public as essential for civil society.<sup>63</sup> The Institute crest – which was designed by Fleming – continues to feature surveying equipment: level, compass, theodolite and drafting square.

Surveyor Fleming also continued to thrive. By 1871 he was the Engineer-in-Chief for the Canadian Pacific Railway, responsible for a staff of 800 in exploratory surveys from the Ottawa River to the Pacific Ocean. There was some urgency, because British Columbia had joined Canada on July 20, 1871 with the promise of a railroad being started in two years and finished in 10 years.<sup>64</sup> Fleming knew that: “The first important step towards the construction of the railway being to ascertain ... where a practicable and eligible line could be found, a survey became necessary.”<sup>65</sup> Surveys allowed the railway; the railway satisfied BC and also shortened the distance between Liverpool and China by 1,000 miles (relative to the Union Pacific Railway in the United States).

Surveyor Fleming had a third chapter as a Canadian institution, because he was instrumental in promoting time zones. Until the 1880’s, local time prevailed, such that clocks in Toronto were a few minutes behind clocks in Montreal. Universal time meant a global system of time standards based on an international date line. In 1879, Fleming and the Canadian Institute petitioned the Governor General to bring the matter to the attention of Britain; apparently Canada’s vast geography made us particularly sensitive to progress. By 1881, he presented his ideas at the International Geographical Congress in Venice. Finally, on November 18, 1883 Canada adopted time zones. Fleming’s strength was in using institutions such as the Royal Society of Canada, the Canadian Institute, the American Association for the Advancement of Science, and the American Society of Civil Engineers to promote universal time in the face of “national rivalry and odious indifference.”<sup>66</sup>

### **Vignette 5: The curious chapter of irrigation**

Much to his chagrin, Fleming’s favoured route for the CPR – through Saskatoon, Edmonton and the Yellowhead Pass – was rejected in favour of a southerly route through an arid part of Canada - Palliser’s triangle. And this allows us to discuss the link between:

- A grist mill on the Granby River in Québec in 1831; and
- A change to the Québec *Civil Code* in 1918.

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<sup>63</sup> Winter 2017 RCIScience Talks: Friedman. *The biological basis of obesity*. January 15, 2017.

<sup>64</sup> Shaw. *Tales of a pioneer surveyor*. p7. 1970

<sup>65</sup> Fleming. *Progress report on the Canadian Pacific Railway – Exploratory survey*. Addressed to the Honourable HL Langevin, Minister of Public Works. p3. April 1872.

<sup>66</sup> Creet. Sandford Fleming and universal time. *Scientia Canadensis: Canadian journal of the history of science, technology and medicine*. v14-n1. p68. 1990.

A dispute on the Granby River between a downstream grist mill and an upstream tannery ended up at the Privy Council, which allowed a riparian proprietor to “dam up the stream for the purpose of a mill, or divert the water for the purpose of **irrigation**.”<sup>67</sup> This decision set the cat amongst the pigeons, inspired a disparate group of surveyors across western Canada, and had a ripple effect across most jurisdictions – including Québec and Ontario.

During that era, surveyors were called upon to address wetlands, watercourses, riparian rights, drainage and irrigation. In overseeing surveys of Manitoba in 1871, Surveyor General Lindsay recognized the value of wetlands, because “they give without the least trouble of cultivation, extremely rich hay meadow.”<sup>68</sup> It was common in the Red River settlement to use the marsh grass - the spongy stuff between upland and watercourse - for hay. Debate about drainage led to the 1885 transfer of wetlands (which had remained federal Crown land because it was too wet to farm) from Canada to Manitoba.<sup>69</sup>

In 1884, surveyor Klotz reported on the Saskatchewan River – seasonal flows, widths, depths and floodplains. The exploratory survey took him from the forks of the River to Hudson’s Bay, during which he noted that “the water in the river seems to be in a constant state of **ebullition**.”<sup>70</sup> At Cumberland Lake, he noted that the difference in water levels between July and October was seven feet, and that there was a cycle of six years each of high and low waters. At The Pas, the cycle of high and low waters was seven years each. Such information was valuable at the time to understanding the Saskatchewan River basin; it is invaluable now in re-establishing the bounds of island parcels that were established at that time.<sup>71</sup> Of course, Klotz was also invaluable in finding in 1899 – after an absence of 30 years – the report of the survey of the BC-Washington boundary in a dusty box labeled “BNA” on the top shelf of the library at the Greenwich Observatory.<sup>72</sup>

But, it was surveyor Dennis Jr and surveyor Pearce who focused on irrigation as an institution. At the 1894 National Irrigation Congress, Dennis Jr learned that the St Mary’s River was to be diverted into the Milk River. This meant diverting waters from the South Saskatchewan River basin (in Canada) into the Missouri River basin (in the United States), depriving Canadian farmers. He proposed an International Commission among Canada, the United States and Mexico “to adjudicate conflicting rights on the international streams of the North American continent.”<sup>73</sup> Dennis’ lobbying led directly to the creation of two institutions - the International Waterways Commission in 1905 and the International Joint Commission in 1909 (whose mandate continues to be all trans-boundary waters).

Concurrently, surveyor Pearce was instrumental in getting the Powers-that-Be to acknowledge that the southern Prairies were arid, and that agriculture was incompatible with the riparian right to take water.<sup>74</sup> It was a tough sell. Members of Parliament were reluctant to acknowledge such a reality: “It is not advisable to advertise that the North-West is a country where irrigation is necessary.”<sup>75</sup> Pearce

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<sup>67</sup> *Minor v Gilmour*, 1859 CR 3 AC 230.

<sup>68</sup> In: Bower. The great transformation? Wetlands and land use in Manitoba during the late 19<sup>th</sup> century. *Journal of the Canadian Historical Association*. v15-n1. p32. 2004.

<sup>69</sup> *William Pearce Manuscript*. p44. 1925 (Published in 2013).

<sup>70</sup> Klotz. Report on exploratory survey to Hudson’s Bay. *Annual Report of the Department of the Interior, 1884*.

<sup>71</sup> Plan 3210 CLSR; Plan 239 IASR – Opaskwayak Cree Nation 21P.

<sup>72</sup> Klotz. History of the 49<sup>th</sup> parallel west of the Rocky Mountains. *Geographical Review*. v3-n5. p384. May 1917.

<sup>73</sup> Dreisziger. A surveyor advises the government. *The Canadian Surveyor*. p141. March 1975.

<sup>74</sup> Doctrine of appropriation. Mitchner. William Pearce and federal government activity in the west, 1874-1904. *Canadian Public Administration*. p235. 1967. Allen. Riparian rights in the west. *Geomatica*. v50-n3. p314. 1996.

<sup>75</sup> Wilson. 1890. In: Burchill. The origins of Canadian irrigation law. *The Canadian Historical Review*. p359. 1948.

persisted. At the 1890 AGM of the Association of Dominion Land Surveyors he argued for legislation that responded to the arid ecosystem. In 1894, his advocacy bore fruit in the *Northwest Irrigation Act*, which vested in the Crown: all waters and the beds of most watercourses.

The legislation eliminated the right to take water willy-nilly. It significantly eroded, but did not eliminate the *ad medium filum* presumption (by which a riparian parcel is presumed to extend to the middle of the watercourse).<sup>76</sup> The 1894 legislation was trend-setting. Soon thereafter, provinces and territories started to retain most watercourses in the public interest: so as to generate electricity; to regulate floodwaters in spring; to boost flows later in the year:<sup>77</sup>

- Ontario in 1911,
- Québec in 1918,
- Nova Scotia in 1919,
- the three northern Territories in 1950,
- BC in 1961,
- New Brunswick in 1982, and
- Newfoundland & Labrador.<sup>78</sup>

Thus, surveyors contributed to what has been called: “a curious chapter in the history of institutions.”<sup>79</sup>

#### **Vignette 6: Let the man go free<sup>80</sup>**

The Alaska panhandle – the strip of land between British Columbia and the Pacific Ocean – was first defined in 1825, in a Convention between Russia and Britain. The boundary of Russian influence – so as not to impede the fur-trade - started at 54-40 N, then up the Portland Canal to 56N, then parallel with the coast along the summit of the mountains to the 141<sup>st</sup> line of longitude, and then north to the Beaufort Sea. If the mountains lay more than 10 leagues (about 50 km) from the coast, then the boundary was to “parallel the windings” of the coast within 10 leagues. In 1867, Russia transferred Alaska (which included the panhandle) to the United States for \$7.2M. Soon thereafter, a gold rush on the Stikine River meant an influx of miners and the need to survey the jurisdictional boundary between Canada (BC) and the USA (Alaska). However, the cost of \$1.5M over seven years dissuaded both countries from surveying at that time.

And then, in 1876, Peter Martin assaulted somebody on the Stikine River. He was arrested by BC officials. But wait: Did BC have the jurisdiction (authority) to arrest Martin? The answer depended on where the assault took place. If it took place in BC (east of the boundary), then yes: the arrest was valid. However, if it took place in Alaska (west of the boundary), then no: the arrest was invalid. Surveyor Hunter was dispatched by the Surveyor General for Canada to survey the boundary at the Stikine River, which he established 24.7 miles east of the shore.<sup>81</sup> The site of the assault was west of the boundary

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<sup>76</sup> Eroded, but not eliminated, because the 1894 Act did not apply to undertakings before 1894 (e.g. as with the HBC and the CPR), nor did it apply to First Nation Reserves.

<sup>77</sup> Ballantyne. *Water boundaries on Canada lands: That fuzzy shadowland*. Appendix 2 - p63. SGB-NRCan 2016.

<sup>78</sup> *Water Resources Act*, s9.

<sup>79</sup> Burchill. The origins of Canadian irrigation law. *The Canadian Historical Review*. p353. 1948.

<sup>80</sup> Inspired by: Zappa. The Illinois enema bandit.

<sup>81</sup> Thus, 12.5 miles west of Choquette’s house and store (commonly called Bucks trading post).

(i.e. within 24.7 miles of the shore) in Alaska. The arrest was invalid and Martin was released by BC authorities. The lesson was simple: Surveying meant that a man who had been unjustly detained and to whom the presumption of innocence applied was spared the terrors of the BC criminal justice system.<sup>82</sup>

Prompted by the Martin assault/arrest/release, Canada and the USA realized that surveying the entire boundary was critical.<sup>83</sup> Conventions of 1892 and 1903 established a temporary International Boundary Commission (IBC) and a Joint Tribunal to survey the panhandle boundary and to resolve seven boundary ambiguities. Over 18 field seasons, between 1877 and 1920, the boundary was surveyed using 1,200 camera stations and 5,000 photographs. The 1903 Award of the Joint Tribunal is the precedent for the Treaties of 1908 and 1925 and the 1960 legislation that authorizes the permanent IBC, which continues to ensure jurisdictional certainty between Canada and the United States.<sup>84</sup> So, without an ambiguous panhandle description, a need to demarcate the boundary, and a legacy of ad hoc surveys, the IBC would now not exist, meaning that there is a direct connection between Hunter's survey of 1877 (to resolve the assault issue) and the IBC.<sup>85</sup>

### **Vignette 7: Heavy moral responsibility**

The decade between 1914 and 1924 saw surveyors **invent** land use planning in Canada. In 1914, surveyor Adams was appointed as the Town Planning Advisor to the federal Commission of Conservation. In a chat to the 1915 ALSA – AGM, surveyor Seymour extolled the need for planning, and described the role of the surveyor. Seymour – licensed to survey in Québec, Ontario, Saskatchewan and Alberta and on Dominion Lands, soon pursued town planning full-time, chairing a Committee on Town Planning for the Association of Dominion Land Surveyors. By 1918, the Association of DLS, working with the Engineering Institute and the Architectural Association, lobbied for a Town Planning Institute of Canada.<sup>86</sup> It was argued that the surveyor “ought to be interested in the best use of land, not just in the accurate measurement of it.”

In 1924, the editorial in the *Canadian Surveyor* journal promoted a School of Town Planning in Ottawa:

Town planning has evolved and is the great sociological achievement of the age ... The land surveyor has much influence upon subdividing and a heavy moral responsibility in the sociological results ... The future of surveying would seem to hold great opportunities.<sup>87</sup>

Surveyors long served the Town Planning Institute: Seymour was an early President; Surveyor General Deville was an early Vice-President; and in 1953, leMay was elected Vice-President.<sup>88</sup>

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<sup>82</sup> “In an iron coffin, with spikes on the inside.” Monty Python - Ralph Mellish. *Matching Tie & Handkerchief*. 1973

<sup>83</sup> The USA accepted the surveyed boundary at the Stikine River only for customs and jurisdiction purposes: International Boundary Commission. *Report – Tongass Passage to Mount St Elias*. p190. 1952.

<sup>84</sup> Ballantyne. The thinning of the boundary: The genesis of the IBC. *Conference: Re-imagining the Canada-United States border*. Carleton University. January, 2010.

<sup>85</sup> Ballantyne. “One waits, shiver” or “Madness, betrayal & the lash”: Defining & surveying the British-Columbia-Alaska boundary. *46<sup>th</sup> Annual Alaska Surveying & Mapping Conference*. Anchorage. February 2012.

<sup>86</sup> Now the Canadian Institute of Planning.

<sup>87</sup> Editorial. *Canadian Surveyor*. v1-n10. p2. 1924. In: Thomson. *Men and Meridians*. Volume 3. Minister of Supply and Services Canada. pp180-193. 1969.

<sup>88</sup> Thomson. *Men and Meridians*. Volume 3. Minister of Supply and Services Canada. pp180-193. 1969.

## Vignette 8: Balm of Gilead

Surveying provided the first systemic record of the land, across wide swaths of Canada. Field notes recorded information about topography, wetlands, watercourses, vegetation, soils, existing settlements, transportation routes, mineral deposits, rock outcrops, current uses and future potential, and so on. The inventory was valuable at the time, of course, in allowing parcels to be created and then granted; and in making the distinction between arable lands (which affected sale prices) and non-arable lands (such as marsh-lands). Such records applied to both lands granted in freehold tenure (fee simple) and to large parcels set aside for First Nations' communities. As but one example, across the Prairie Provinces, Reserves were often allocated on the basis of 640 ac (one sq mile or one section) per family of five. Areas of hay marsh were often included in the Reserve parcel, but were not counted against the per-family (or per capita) allocation, such that only arable lands were used to calculate the allocation.<sup>89</sup>

That was then, this is now. Such meticulous records from surveyors are now of much value in two settings. First, they are useful in litigation, because determining what happened on the ground at Time 1 (**then**) is fundamental to ascertaining the location and character of the boundary at Time 2 (**now**). Field notes are – often – the best evidence of what happened on the ground (what was observed and done at time of survey). There have been some 40 decisions of the Canadian courts that have referred to or relied on surveyors' field notes. Reliance on field-notes varies along a spectrum; they can be pivotal, supportive, merely revealing or inconclusive.

Seven recent cases involved parcels that had been surveyed as few as 62 years ago and as much as 226 years ago (i.e. between 1781 and 1955).<sup>90</sup> The cases set out that survey field notes in litigation are invaluable because they are:

- Accepted (they provide answers about intention and action in the distant past);
- Available to all (they reveal findings, opinions, and conclusions that are relevant); and
- Comprehensive (including, as they do, land tenure and ecosystem information, not merely boundary information).

This latter attribute – comprehensiveness – explains the second way in which field notes are now of value. They are excellent evidence of ecosystems in the past. These records represent the nexus between Indigenous and European land development; such base-lines are useful now in land-use and heritage planning, forestry, ecology, hydrology, archaeology and agriculture.<sup>91</sup> In some jurisdictions (e.g. New Brunswick, British Columbia) witness trees were noted; in other jurisdictions (e.g. Québec, Ontario) changes in species were noted, as from pine to spruce, or from maple to Balm of Gilead (a type of poplar or fir).<sup>92</sup> Indeed, there is one plan of survey that ties to a specific species of flower in Saskatchewan.<sup>93</sup>

While witness trees do not necessarily represent actual vegetation cover at the time of survey (owing to selection bias), tree species along a traverse line or boundary line is accurate. Indeed, Instructions in **June 1867** (a mere **three days** before Confederation) set out that surveyors were to: "Enter each kind of

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<sup>89</sup> Plan 9882A CLSR – Sucker Creek Reserve 150A.

<sup>90</sup> Ballantyne. In praise of small data: survey field notes in litigation. *Geomatica*. v69-n1. p218. 2015.

<sup>91</sup> Karrow & Suffling. Pre-settlement vegetation maps generated using Ontario early survey. *The Canadian Geographer*. v60-n1. p135. 2016.

<sup>92</sup> Used as a monument at the south-east corner of Pointe Grondine Reserve. Plan 186 CLSR.

<sup>93</sup> Spotted in SGB-NRCan's rigorous plan review process by Nathan, relayed by Erin.

timber in the order of its relative abundance.”<sup>94</sup> Historical geographers<sup>95</sup> and environmental scientists now use this information to calculate rates of ecosystem-change and to assess biodiversity.

### **Vignette 9: Friendly resolution of conflicts**

Surveying has been at the forefront of alternative methods of establishing boundaries, and of resolving disputes over those boundaries. This is a credit to:

- Surveyors’ devotion to the potpourri of law and facts; and
- Alternative dispute resolution (ADR) being “ideal for property disputes between neighbours.”<sup>96</sup>

The watershed in the history of ADR is the *Jay Treaty* of 1794 between Britain and the United States, which allowed disputes to be settled by Commissioners appointed by the two parties.<sup>97</sup> Only three types of disputes were identified; the first was a boundary dispute between the United States and proto-Canada. Starting in 1794, Commissions decided boundary issues impartially – not politically - using principles of law and evidence. The parameters of the 1794 Treaty – negotiation between surveyors based on legal principles and objective facts - continue to resonate in the IBC today. They also resonate in the Alberta-British Columbia Boundary Commission, which works to maintain the inter-provincial boundary and to replace some sections of the watershed with a rectilinear line.

A second form of ADR in Canada is third-party arbitration, and surveyors and boundaries have also been at the forefront of its development. The westerly section of the Canada – United States boundary was described ambiguously in the 1846 *Oregon Treaty*, as running:

- To the middle of the channel which separates the continent from Vancouver’s Island,
- Thence southerly through the middle of the said channel,
- To the Strait of Juan de Fuca and the Pacific Ocean.

The question was: The middle of which channel – Haro or Rosario? Uncertainty led to skirmishes on San Juan Island over sheep in 1855 and over a pig in 1859. Britain and the United States both stationed soldiers on the island for 12 years.<sup>98</sup> Finally, the question was submitted to the Emperor of Germany for binding arbitration, who then referred the question to three fact-finders.<sup>99</sup> Two of the three experts found the boundary to lie west of San Juan Island; the Emperor agreed in 1872.

Such binding arbitration informs the Ontario *Boundaries Act*, which offers an alternative to the courts for confirming boundaries and resolving disputes. The legislation was drafted by a surveyor in 1959, has been used extensively by surveyors (on behalf of applicants and objectors), and has Tribunal hearings adjudicated by surveyors (in the guise of Examiners of Survey). In 58 years, few applications for

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<sup>94</sup> Devlin, Surveyor in Chief. Upper Canada - Crown Lands. *Remarks on Upper Canada Surveys*. pvii. June 28, 1867.

<sup>95</sup> Heidenreich. Appendix: A procedure for mapping the vegetation of northern Simcoe County from the Ontario land survey. In: Gentilcore & Donkin. Land surveys of southern Ontario. *Cartographica*. v10-n2. 1973.

<sup>96</sup> Madame Justice Conrad. University of Calgary. February 7, 2000.

<sup>97</sup> Kaikobad. *Interpretation and revision of international boundary decisions*. Cambridge Univ Press. p61. 2007.

<sup>98</sup> Vouri. *The pig war: Standoff at Griffin Bay*. Griffin Bay Bookstore. 2006.

<sup>99</sup> Hunter (editor & translator). *Northwest Water Boundary: Report of the experts summoned by the German Emperor as arbitrator under Articles 34-42 of the Treaty of Washington of May 8, 1871, preliminary to his Award dated October 21, 1872*. University of Washington. 1942.

confirmation have proceeded to a Tribunal; fewer still have been successfully appealed to the courts. There have been only 22 appeals to the courts; 80% of recent cases have been affirmed.<sup>100</sup> New Brunswick has a similar institution. Twice the courts have chided litigants for not using the alternative process.<sup>101</sup> In a third example of binding arbitration, the Ontario *Surveys Act* allows the Surveyor General to arbitrate a municipal resurvey (of a concession or side road).<sup>102</sup> There have been two resurveys in the past 35 years, and the court affirmed the one decision that was appealed.<sup>103</sup>

The three Ontario and New Brunswick surveying-centric institutions are efficient (faster and cheaper) and less intimidating than litigation. Third-party fact finding mediation also meets those criteria. Surveyors are sometimes retained in an *ad hoc* manner to impartially sift facts and offer non-binding recommendations, as for the location of the northerly boundary of the Mississagi Reserve in 1986.<sup>104</sup>

Finally, bornage has long been a thing in Québec, to address uncertainties/disputes about the location of a boundary.<sup>105</sup> The surveyor is “called upon to play the role of arbiter of private property boundaries to the fullest.” As an institution, it is a tribute to Québec’s exceptionalism, because it allows for the “friendly resolution of conflicts.” The legitimacy of the process was affirmed as early as 1888 by the Supreme Court of Canada, over a boundary issue between two mining companies, each of which had the right to mine gold on parts of Lot 11, St Charles Concession, St Francois Parish, Beauce. Three surveyors were appointed; Legendre’s opinion was preferred.<sup>106</sup>

### **Vignette 10: Keepin’ up with the Jones’**

Parcels, boundaries and surveys continue to influence. In 2016, researchers used small subdivisions in Toronto (each with 13 parcels on average) to test the theory that income inequality causes financial distress. Small subdivisions allowed conspicuous consumption to be observed. That is, after one parcel-owner won the lottery, the other 12 parcel-owners felt compelled to keep pace; keepin’ up with the Jones’. The researchers’ hunch was confirmed.<sup>107</sup> Across small subdivisions, a \$1,000 increase in the lottery prize causes a 2.4% rise in subsequent bankruptcies among the winner’s neighbours.<sup>108</sup>

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<sup>100</sup> *Halliday v Nicholson* (2005); *Nightingale v Brooks* (2008); *Ellard v Tiny Township* (2012); *Bass Road v Michnick* (2015); *Godfrey v Ontario* (2016).

<sup>101</sup> *Norris v Black*, 2013 NBCA 62.

<sup>102</sup> Barzo & Stanton. The municipal resurvey: The resurrection. *Ontario Professional Surveyor*. p30. Winter 2014.

<sup>103</sup> *Dale v Tiny Township*, 2015 ONSC 7340.

<sup>104</sup> Lambden. *Mississauga Band of Ojibways: Location of the northern boundary*. April 6, 1986.

<sup>105</sup> Fortin. Solving property line problems the Québec way. *Professional Surveyor Magazine*. p52. March 2008.

<sup>106</sup> *McArthur et al v Brown et al*, 1888 CanLII 34 (SCC). In a 1927 dispute about the south-east limit of the Seigneurie of Rimouski, the court affirmed that the “boundary had been *tiree, tracee et borne*” by surveyor Ballantyne in 1839: *Gagnon v St Pierre*, 1927 CanLII.

<sup>107</sup> Formally, the null hypothesis was rejected.

<sup>108</sup> Agarwal. *Does inequality cause financial distress?* Reserve Bank of Philadelphia. February 2016.

## Part 3 – Speculating about future contributions

### Heading for the waters of prosperity

There are a couple of cautionary tales about predicting the future.<sup>109</sup> In 1900, Canada and Argentina “were seen as twins, progressing rapidly down parallel tracks.”<sup>110</sup> The parallels were uncanny – young democracies, vast landmasses, abundant natural resources, much foreign investment and immigration, and similar populations.<sup>111</sup> Yet Canada prospered (its GDP increased by a **factor of eight**) while Argentina floundered (its GDP increased only by a **factor of three**), primarily because of the positive effects of institutions in Canada.

In 1883, a pundit calling him- or her-self “Ralph Centennius” predicted what Canada would look like now.<sup>112</sup> Let’s compare Ralph’s predictions with actuals:

- Population of Canada:	93M predicted;	35M actual
- Members of Parliament:	15 predicted;	338 actual
- Population of Churchill, MB:	200,000 predicted;	813 actual
- Provinces:	15 predicted;	10 actual
- Rocket cars: <sup>113</sup>	6,000 km/h predicted;	800 km/h actual
- Private vehicles:	Electric tricycles predicted;	gasoline cars actual

Ralph concluded with a shout-out to institutions: “And if the development and advance have been great industrially and commercially, so have they been great, almost greater, socially” meaning that Canada is “heading for the waters of prosperity.”

### Reconciliation

Reconciliation is now lurking in the waters of prosperity. For surveying, reconciliation is a many-splendored thing. It can mean:

- Policies in Nunavut that promote land availability, strategic and community planning, private-market incentives and diversified housing, given the need for 1,500 dwellings in Iqaluit alone.<sup>114</sup>
- Infill, laneway, non-traditional and affordable housing in cities such as Toronto, Vancouver and Edmonton, where speculative and absentee ownership escalates prices.

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<sup>109</sup> There’s also some crazy shit. To wit, the use of worm-holes and the discovery of other life forms in the universe will lead to an enlightened view of the cosmos, uniting humans, accelerating the end of countries, and forming world governance: Aderin-Pocock, et al. *Smart things: Future living report*. 2016.

<sup>110</sup> Editorial – Our future: Make Canada greater. *The Globe and Mail*. pF6. January 28, 2017.

<sup>111</sup> Canada = 5.3M people; Argentina = 4.7M people.

<sup>112</sup> Or, at least, in 1983. Ralph Centennius. *The Dominion in 1883*. 1883. See: Young, et al. *Moving natures: Mobility and the environment in Canadian history*. Introduction. 2016.

<sup>113</sup> Collisions were predicted to never happen, owing to “the rigid adherence to very strict regulations.”

<sup>114</sup> Nunavut Housing Corporation. *GN long-term comprehensive and homelessness strategy*. 2012.



- Finding common ground between resource extraction and transport on the one hand (such as oil sands, shale gas and pipelines) and the social, cultural and environmental concerns of Canadians (and others) on the other hand.
- Québec's cadastral reform that has been reconciling occupation, the extent of legal rights and a seamless database over the past 25 years.<sup>115</sup> Such reform is part of a rich lineage in Québec, because as early as 1854 the *Seignioral Act* authorized Commissioners to determine boundaries.<sup>116</sup> In 2017, there is now debate about using cadastral reform to expand the use of bornage beyond a dispute resolution process, to sanctioning the original subdivision.<sup>117</sup>

When it comes to Indigenous peoples, Canada's development has ridden the wave of reconciliation – initially honoured, then given lip service, and now being made real.<sup>118</sup> Given its links with **both** the land and the past,<sup>119</sup> surveying is **well-positioned** to encourage reconciliation of Indigenous peoples and, in fact, **all Canadians** with the land. In 1870, Prime Minister MacDonald hinted at this surveying-reconciliation nexus, as Canada expanded west across the Red River:

“It is, of course, important to have land surveyed for settlement ..., but that is a **secondary** condition to **the general assent and support of the people.**”<sup>120</sup>

MacDonald recognized what surveyors instinctively know; that surveying is as much about social negotiation as it is about measuring distances and directions, or northings and eastings. There is a community calculus ever-present, such that surveyors are concerned about the implications when a parcel is created, a boundary is shifted, a riparian strip is excluded, access is allowed, or tenure is reformed. The interplay between boundaries, parcels, possession and the community was illustrated:

- At Kahnawake First Nation during an 1882 survey by surveyor Walbank,<sup>121</sup>
- Through parcel fabric renewal from 2010 to 2013 across five First Nation communities.<sup>122</sup>

So, what might such reconciliation look like for surveying? It might assist with:

- Specific Claims that involve parcels and boundaries, given that survey issues comprise 22% of the 1,700 claims that have been submitted by First Nations.<sup>123</sup>
- Third-party fact-finding (either binding or not) to resolve boundary issues.<sup>124</sup>
- Mediation between the two Crowns.<sup>125</sup>

<sup>115</sup> Genovese & Roy. Challenges and issues of the post-reform Quebec cadastre. *FIG Congress 2010*. Sydney, Australia. April 2010. Masse & Gervais. The Québec cadastre and its dead angles. *Geoide*. Brussels. May 2010.

<sup>116</sup> *R v Labrador Company*, [1893] AC 104.

<sup>117</sup> Fortin, et al. Un système d'arpentage pour soutenir le régime foncier. *Mémoire présenté à l'Ordre des arpenteurs-geomatres du Québec*. Février 2009.

<sup>118</sup> Truth and Reconciliation Commission of Canada. *Calls to Action*. 2015.

<sup>119</sup> Cameron. *William Drewry & land surveying in BC, 1887-1929*. MA thesis. Univ of Victoria. p112. 2009.

<sup>120</sup> Thomson. *Men & Meridians*. Volume 2. 1967. p15.

<sup>121</sup> Rueck. Commons, enclosure, and resistance in Kahnawake Mohawk territory, 1850-1900. *The Canadian Historical Review*. v95-n3. p352. September 2014.

<sup>122</sup> Ballantyne & Rogers. Ascertaining First Nation's communities for optimum fabric renewal: Parcels as enablers. *Annual World Bank Conference on Land & Poverty*. Washington DC. April 2012.

<sup>123</sup> Tompkins & Ballantyne. Reconciling Indigenous lands with Honour of the Crown: Certainty in bounds, security in parcels & equity in rights. *Annual World Bank Conference on Land & Poverty*. Washington DC. March 2017.

<sup>124</sup> Coyle. The use of neutral experts in land claim negotiations. In: Macfarlane. *Dispute resolution*. p468. 1999.

- A boundary tribunal for parcels of Aboriginal title land.<sup>126</sup>
- Surveying and mapping capacity-building within Indigenous communities, as exemplified by:
  - o The current partnership with Wikwemikong First Nation.<sup>127</sup>
  - o The curriculum which is now being drafted for the Certificate to be offered by the Tulo Centre of Indigenous Economics.<sup>128</sup>
- Fit-for-purpose surveying, as a function of land use, parcel value and location.<sup>129</sup>

Just sayin'. After all, to borrow from Graeme Sandy of the National Aboriginal Land Managers Association (NALMA):

First Nation's people have always had an acute sense of where we are in the world. We navigated throughout our territories guided by our stories, landmarks, waters and the heavens. Present day mapping and geospatial tools and technologies will help guide us in the future as adaptation has always been our strongest asset."<sup>130</sup>

### Agents of change:

Finally, Canadian surveyors are "agents of change."<sup>131</sup> As shown in the 10 vignettes, surveying has not simply embraced the status quo and resisted innovation. Rather, surveying has embraced existential challenges in the public interest. Scanning, phoning, droning,<sup>132</sup> lidaring, pdf-ing and gps-measuring are certainly part of the evolving institution that is surveying.<sup>133</sup> However, beware of focusing on technology at the expense of socio-cultural issues. It's a false dichotomy; **the equation is both**, not either-or.

So, grasp the nettle. Be both bold and nimble, and stop whining. There is no need to "change the public's perception of surveyors," as PSC laments. Surveying has shaped Canada and will continue to shape Canada. Surveyors are regarded as "trusted professionals," meaning that raising "awareness and understanding of the value of the surveying profession" is redundant.<sup>134</sup> A recent study of 8,400 km of boundaries, that were surveyed starting in 1872, found very high accuracy. On average, the distances measured **then** are within 0.2% of re-measured distances **now**.<sup>135</sup>

So, land surveyors have a comparative advantage in Canada. As Timbuk 3 suggested, the future's so bright, you gotta wear shades.

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<sup>125</sup> Ballantyne. Boundary disputes: Price of federalism. *Keynote: Annual NZIS Conference*. Dunedin NZ. August 2013.

<sup>126</sup> Ballantyne. A modest proposal: a boundary tribunal for Aboriginal lands. *Geomatica*. v70-n1. p60. 2016.

<sup>127</sup> Shout-out here to Gavin Lawrence, despite his Springbok rugby allegiance.

<sup>128</sup> Ballantyne, et al. Establishing property rights systems to facilitate development. Chapter 3 in: *Building a competitive First Nation investment climate*. 2014.

<sup>129</sup> FIG/World bank/GLTN. *Fit-for-purpose land administration*. 2014. Knight, et al. *Community land protection: Facilitators guide*. Namati. 2016.

<sup>130</sup> Graeme Sandy. National Aboriginal Lands Managers Association. Shared on January 25, 2017.

<sup>131</sup> Cameron. *William Drewry & land surveying in BC, 1887-1929*. MA thesis. Univ of Victoria. p107. 2009.

<sup>132</sup> Jenkins. *Application of aerial drones in zoning and urban land use in Canada*. M Plan thesis. Ryerson Univ. 2015.

<sup>133</sup> Also, beware of re-wiring brains by navigating with gps: Hutchinson. Global positioning systems. *The Walrus*. November 2009. Milner. *Pinpoint: How gps is changing technology, culture and our minds*. Norton. 2016.

<sup>134</sup> Professional Surveyors Canada. *Join PSC and together let's change the public's perception of surveyors!* 2016.

<sup>135</sup> Across 100 parcels: Rogers, et al. Assessing the mapping accuracy of Aboriginal lands: Enhancing tenure security and land governance. *Annual World Bank Conference on Land & Poverty*. Washington DC. March 2016.