Urban History Review
Revue d'histoire urbaine

URBAN HISTORY REVIEW
REVUE D'HISTOIRE URBAINE

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Volume 44, numéro 1-2, fall 2015, spring 2016

Environmental Nuisances and Political Contestation in Canadian Cities

URI : https://id.erudit.org/iderudit/1037234ar
DOI : https://doi.org/10.7202/1037234ar

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Éditeur(s)

Urban History Review / Revue d'histoire urbaine

ISSN

0703-0428 (imprimé)
1918-5138 (numérique)

Découvrir la revue

Citer cet article

Munton, D. & Temby, O. (2015). Smelter Fumes, Local Interests, and Political Contestation in Sudbury, Ontario, during the 1910s. *Urban History Review / Revue d'histoire urbaine*, *44*(1-2), 24–36. https://doi.org/10.7202/1037234ar

Résumé de l'article

Pendant la deuxième moitié des années 1910, la fumée de soufre à Sudbury (Ontario) a opposé les agriculteurs et l'industrie des mines et de la métallurgie, laquelle était l'un des secteurs les plus importants de l'économie. La demande croissante de nickel pendant la Première Guerre mondiale a mené à l'expansion des chantiers de grillage de Copper Cliff et O'Donnell, situés à proximité, accroissant ainsi la fumée près de Sudbury et détruisant les récoltes. Les leaders de la communauté d'affaires de Sudbury, représentés par la Chambre de commerce de la ville, ont tenté d'équilibrer les besoins des deux secteurs (agriculture ainsi que mines et métallurgie) et de faciliter leur coexistence dans la région. Parmi les mesures mises en place, les membres de la Chambre de commerce et les agriculteurs ont intenté des poursuites sur la base de la nuisance avec l'objectif d'obtenir une compensation monétaire et des injonctions quant aux opérations des chantiers de grillage. Bien que les compensations monétaires aient été décevantes aux yeux des agriculteurs, la menace d'une injonction a suffi à convaincre le gouvernement provincial de bannir les poursuites civiles et de créer un processus d'arbitrage accommodant l'industrie. Cet article décrit l'activisme politique par rapport à la nuisance de la fumée, lequel n'a pas conduit à une solution, et met en lumière les facteurs contextuels ayant contribué à cet échec.

Smelter Fumes, Local Interests, and Political Contestation in Sudbury, Ontario, during the 1910s

Don Munton and Owen Temby

During the second half of the 1910s the problem of sulphur smoke in Sudbury, Ontario, pitted farmers against the mining-smelting industry that comprised the dominant sector of the local economy. Increased demand for nickel from World War I had resulted in expanded activities in the nearby Copper Cliff and O'Donnell roast yards, which in turn produced more smoke and destroyed crops. Local business leaders, represented by the Sudbury Board of Trade, sought to balance the needs of the agriculture and mining-smelting sectors and facilitate their coexistence in the region. Among the measures pursued, farmers and some Board of Trade members turned to nuisance litigation, with the objective of obtaining monetary awards and injunctions affecting the operation of the roast yards. While the amounts of the awards were disappointing for the farmers, the spectre of an injunction was sufficient to convince the provincial government to ban civil litigation in favour of an arbitration process accommodating industry. This article provides an account of the political activism over Sudbury's smoke nuisance that failed to bring about emission controls, highlighting the contextual factors contributing to this failure.

Pendant la deuxième moitié des années 1910, la fumée de soufre à Sudbury (Ontario) a opposé les agriculteurs et l'industrie des mines et de la métallurgie, laquelle était l'un des secteurs les plus importants de l'économie. La demande croissante de nickel pendant la Première Guerre mondiale a mené à l'expansion des chantiers de grillage de Copper Cliff et O'Donnell, situés à proximité, accroissant ainsi la fumée près de Sudbury et détruisant les récoltes. Les leaders de la communauté d'affaires de Sudbury, représentés par la Chambre de commerce de la ville, ont tenté d'équilibrer les besoins des deux secteurs (agriculture ainsi que mines et métallurgie) et de faciliter leur coexistence dans la région. Parmi les mesures mises en place, les membres de la Chambre de commerce et les agriculteurs ont intenté des poursuites sur la base de la nuisance avec l'objectif d'obtenir une compensation monétaire et des injonctions quant aux opérations des chantiers de grillage. Bien que les compensations monétaires aient été décevantes aux yeux des agriculteurs, la menace d'une injonction a suffi à convaincre le gouvernement provincial de bannir les poursuites civiles et de créer un processus d'arbitrage accommodant l'industrie. Cet article décrit l'activisme politique par rapport à la nuisance de la fumée, lequel n'a pas conduit à une solution, et met en lumière les facteurs contextuels ayant contribué à cet échec.

Introduction

The longstanding environmental consequences of the mining and smelter complex near Sudbury, Ontario, are well known. What is less well known is that the earliest years of operations there prompted an environmental protest by farmers and some of Sudbury's most influential citizens. The controversy began in earnest during the first decade of the twentieth century, but intensified during World War I, when a worldwide increase in demand for nickel led to higher production and, consequently, increased sulphur "smoke" pollution. The damage to the Sudbury district's well-established agricultural industry caused alarm among the city's growth-promoting organizations, its local growth coalition, the Sudbury Board of Trade, and its local newspaper, the *Sudbury Journal*.[1] Sudbury's civic leaders did not have the authority to control smelter emissions, nor much power to influence the polluters, but they did seek a resolution to the problem that would enable agriculture and smelting to coexist. Concurrently, however, farmers and some members of the Board of Trade itself turned to the courts. After a series of court decisions found "smoke" damage and awarded compensation to farmers, a small flood of additional lawsuits raised the spectre of an injunction against the smelting companies. In response, the Ontario government in 1921 legislated an end to further litigation and established a smelter fumes arbitration process to consider sulphur damage awards to farmers.

Keeping with the theme of this special issue—environmental nuisances and political contestation—we examine this case, one in which civic stakeholders sought to maintain the city as a place conducive for commerce and growth, through managing the environmental issues inherent in the process. We provide an overview of the development of Sudbury's nickel mining industry and of the environmental pathologies resulting from it, and an account of the rise of local activism and protests against the smoke nuisance and environmental damage done by the smelter industry during the early decades of the twentieth century. First, however, we place our analysis of Sudbury's response to smelter smoke in the growing literature on urban air

pollution politics. The political response by the city's economic elites and farmers, of seeking a mutually acceptable resolution to the problem, is representative of a familiar pattern in studies of air pollution activism.

Air Pollution and the Urban Growth Machine

As explained in the introduction to this special issue, a substantial volume of historical research has shown that the political incentive to address environmental nuisances typically derives from the desire of local economic stakeholders to maintain the conditions favourable for urban growth by managing the pathologies incidental to the process. Four decades ago, Harvey Molotch, in his influential article "The City as a Growth Machine," presented what has since become axiomatic for urban regime theorists.[2] Here he identified the centrality of growth in the urban political context: "I … argue that the desire for growth provides the key operative motivation toward consensus for members of politically mobilized local elites, however split they might be on other issues, and that a common interest in growth is the overriding commonality among important people in a given locale—at least insofar as they have any important local goals at all. Further, this growth imperative is the most important constraint upon available options for local initiative in social and economic reform."[3]

Thus, as Clyde W. Barrow states, in the urban milieu, "the taxes and fees that support public infrastructure, public education, and state-regulated employee mandates should all be regarded as transaction costs" in pursuance of growth. Along the same lines, George A. Gonzalez argues that "clean air policies are functional to the operation of the market and to the realization of profit" from the use and sale of land.[4] Policies addressing smoke nuisances are necessary for managing conflicts among businesses and other landowners, and typically are the outcome of a compromise or consensus among them, with the overarching objective of enhancing balanced local growth.

Research on air pollution political history in both Canada and the United States has indeed identified such actors as central in raising the issue on the public agenda, formulating clean air policy, and applying pressure for a resolution to the problem.[5] These and other studies of environmental nuisances in urban areas illustrate the influence of local growth coalitions (such as chambers of commerce and similar organizations) and urban newspapers.[6] Molotch identifies local newspapers as "the most important example of a business which has its interest anchored in the aggregate growth of the locality."[7] He elaborates on the unique role of the publisher/editor: "The newspaper has no axe to grind, except the one axe which holds the community elite together: growth. It is for this reason that the newspaper tends to achieve a statesman-like attitude in the community and is deferred to as something other than a special interest by the special interests. Competing interests often regard the publisher or editor as a general community leader, as an ombudsman and arbiter of internal bickering and, at times, as an enlightened third party who can restrain the short-term profiteers in the interest of more stable, long-term, and properly planned growth."[8] Notably, Gonzalez and Temby, in separate studies, have identified urban newspapers, and their editorial boards, as key actors in applying pressure to address air pollution in the United States and Toronto, Canada.[9]

Sudbury during first two decades of the last century was a prosperous and rapidly growing city. Its population doubled every decade, increasing from roughly 2,000 in 1901 to nearly 9,000 in 1921.[10] Local historian Oiva Saarinen states that during this period Sudbury became the "hub of the north," thanks to its relative size, its connection—by road or rail—to Copper Cliff and nearby farming communities, advances in communications centred in the city, and the building of government offices, making Sudbury "the base for various provincial government services."[11] While downtown Sudbury experienced a substantial smoke nuisance, the problem was politicized as the result of the effects on the surrounding region. The area's largest smelter complex opened in Copper Cliff, about fifteen kilometres west of Sudbury in the late 1880s, with roasting operations moving further west in the mid-1910s (see below). Farmland filled much of the area surrounding Sudbury and Copper Cliff.

Concerned with the deleterious economic effects of a compromised agricultural sector, members of Sudbury's local growth coalition and the publisher/editor of its main newspaper advocated for a diminution of pollution and attempted to formulate solutions to the problem that would enable farmers and the nickel industry to coexist. In the 1910s, before the Ontario provincial government stepped in to provide its own settlement of the "smoke" issue, Sudbury had two influential elite social groups: the Sudbury Board of Trade and the Sudbury Horticultural Society, with overlapping membership and rotating leadership. Until 1916, its leading and most influential newspaper was the *Sudbury Journal* (the *Sudbury Star* replaced it in importance after the retirement in 1916 of the *Sudbury Journal*'s publisher/editor). All of these organizations were critical of the metal smelting industry and the damage to agriculture that resulted. The Board of Trade was the city's growth coalition. It consisted of roughly 100 members (including businessmen, but also local elected officials) and involved itself with an array of issues related to Sudbury's economic development.[12] In his January 1918 address to the Board of Trade, President W. C. Morrison explained, "The normal function of the Board of Trade is to find and give expression to the needs and wishes of the business men of the community, and to promote the best interests of the town."[13] This organization, in particular, sought to reconcile the needs of both the metal industry and farmers so that they could coexist in the greater Sudbury region.

When the Horticultural Society was formed in 1911, its members included President J. F. Black, Vice-presidents W. J. Bell and the Florence Clary, wife of J. H. Clary, and, as directors, Judge John J. Kehoe, D. M. Brodie, and Sarah Vassey.[14] All were involved in the decision-making on the smelter fumes issue. Black later served as the president of the Board of Trade (1913–1914, and briefly again in 1915), was a miner and real estate developer, and remained influential in Sudbury city planning for the

remainder of the decade.[15] Clary was a lawyer, and farmer, and an active member of the Board of Trade. He and Black were plaintiffs in important smelter smoke court cases discussed below. Kehoe served as the judge in another of the important sulphur damage cases. Vassey was married to Larry O'Connor, Sudbury's mayor 1910–1911 and 1914–1915, who, more importantly, was an influential member of the Board of Trade and involved in the organization's decision-making over the smelter smoke issue. Bell, a wealthy merchant and lumberman, and Brodie, the local police magistrate, were also active Board of Trade members throughout the decade.[16] Thus, the smelter "smoke" issue was taken up by a close-knit local elite, which, as illustrated below, sought to balance the needs of heavy industry and agriculture in the greater Sudbury region.

But neither the engagement of local elites nor activism from other local stakeholders was enough to abate the smelter "smoke" problem in Sudbury. Studies on air pollution political history have sought to identify the factors that make the difference between failed and successful elite activism. Research by both Gonzalez, and Temby and O'Connor, highlight the crucial role of available and economical pollution-abatement technology, enabling industry to maintain operations while lessening the problem. Gonzalez shows this with case studies comparing Chicago in the early 1900s with Los Angeles in the 1940s and 1950s. While a range of economical technologies enabled polluters to lessen emissions in Los Angeles, the same was not true in Chicago. Instead, the local elites advocating for pollution abatement acquiesced and stopped short of demanding pollution controls that might have created an unfavourable regulatory climate for local firms.[17] Temby and O'Connor's research focuses on events sixty years after the events in the present article. During the 1970s and 1980s, acid rain from Sudbury's nickel smelters threatened the health of valuable "cottage country" real estate in Ontario. They show that after years of failure to reduce emissions, or only paltry measures, the availability of proven technology by the early 1980s allowed the Ontario government to force INCO, the largest polluter, to make the process changes it did in the late 1980s.[18]

As we illustrate here—and counter to the findings of previous studies—a lack of available and economical technology did not kill "smoke" abatement in Sudbury in the 1910s and 1920s. Technology and production alterations that would have substantially lessened the "smoke" emissions were available and in use elsewhere. Board of Trade members were not in full agreement about the best way forward, and it is plausible that, had the organization pressured government and industry for more aggressive measures to reduce emissions, reductions might have happened. Yet a more important factor was the lack of jurisdiction Sudbury had to influence the powerful metal industry through municipal legislation. Control of the mining and smelting industry lay entirely with the provincial government, and the smelters were located outside the city's boundaries. What local elites were able to do was to support those affected by the emissions, to propose modest measures to the provincial government, and to join in the legal battle for compensation of crop damage.

To acknowledge that local elites in Sudbury were unable to change the operations of the smelters and reduce their emissions significantly is not to say they completely failed. They could not have taken effective action on their own to reduce emissions, and they may have helped effect other changes. The provincial government made it clear, in word and then in deed, that farming was not going to slow one of the province's most lucrative economic engines—through its publication of the Royal Ontario Nickel Commission report, by ending the sale of farming-designated land for agriculture, and ultimately constricting the role of the courts to protect the farmers and help them to maintain operations. Given this, by the early 1920s the Board of Trade and the local press embraced their mono-industrial economic reality.[19] The Horticultural Society, on the contrary, went the way of much of the region's flora, ceasing to exist after merely a few failed growing seasons.[20]

Discovering and Mining Sudbury's Nickel

Sudbury, Ontario, is located 400 kilometres north of Canada's present-day largest city, Toronto, between Lake Huron and the Ontario-Quebec border. Often considered by locals to be "northern Ontario," it is in fact well south of the forty-ninth parallel that comprises much of the Canada-US boundary. The area is dominated geographically by what is now called the Sudbury Basin, directly north of the city—a sixty-kilometre-long, thirty-kilometre-wide remnant of a crater formed billions of years ago by a huge meteor or comet.[21]

The city began life as a Canadian Pacific Railway (CPR) stop, Sudbury Junction. Discovery of Sudbury's ore deposits is often—but wrongly—attributed to construction of the CPR in the late 1800s through the northern Ontario wilderness.[22] The railway line coincidentally cut directly through what was later identified as the region's huge, oblong-shaped "nickel" basin. The mineral abundance below-ground was evident in surface rock. The first mines near Sudbury were open-pit operations, including what became the huge Creighton Mine.[23] It is thus possible, if not likely, that aboriginal people discovered and made some use of mineral deposits in what became the Sudbury area long before Europeans arrived, and it is possible that members of the local Atikameksheng Anishnawbek First Nation assisted the first non-aboriginal prospectors.[24]

This may well be speculation, but Europeans learned—somehow—of mineral deposits in the Sudbury area a full century before the CPR arrived, a fact that tends to support the idea of local aboriginal knowledge.[25] In the mid-1850s, a Geological Survey of Canada worker, Alexander Murray, confirmed the presence of both copper and nickel but apparently failed to appreciate the extent of the ore bodies.[26] Around the same time, a surveyor for the (provincial) Commissioner of Crown Lands, Albert Salter, observed the impact on his compass of a large magnetic field near Whitefish Lake in Snider Township. He was probably detecting the nickel ore body that became the Creighton Mine, about fifteen kilometres west of where the towns of Sudbury and Copper Cliff were eventually located.[27]

Then, a quarter century later, CPR workers serendipitously located the deposit that became the Murray Mine. Commercially driven exploration followed through 1884 and 1885, some of which confirmed significant deposits of copper.[28]

In 1886 the newly formed, Ohio-based Canadian Copper Company purchased the rights to promising properties in the Sudbury area, including the Murray and Creighton Mines. It quickly began copper mining operations and succeeded where other ventures had failed. In the absence of a smelter in Sudbury, the company sent raw ore to its plant in the United States. Analysis in 1886 identified nickel in significant amounts. Finding nickel and copper together in an ore body is common, but the Sudbury deposits were unusually rich in nickel. Taken together, the deposits were also extraordinarily large, a consequence of the area's unique geology. In a remarkably short period of time, nickel production in Sudbury accounted for most of the world's supply. This timeline is not merely of historical interest; it is critical to understanding not only the growth of the Sudbury mining-smelting industry but also the emergence of the environmental protests in the area and the manner in which courts and governments dealt with those protests.

In the 1880s nickel was still a minor metal in search of major uses. Initially the Sudbury area operations did not even save the nickel in the copper matte, in part because there were unsolved problems in extracting it.[29] A nickel smelter, planned and built by Dr. Edward D. Peters for the Canadian Copper Company, went into operation in late 1888. The timing was exquisite. By 1890, metallurgists recognized that nickel-steel alloys were both lighter and much stronger than steel itself. These alloys immediately found use in products such as armour plate and other military weaponry.[30] The price of refined nickel, which had been sliding over the previous decade, turned around.

With new potential markets for nickel, the profits from its production became clear. In 1902 a group of New York–based investors created the International Nickel Company (INCO), a joint venture of Canadian Copper and two American companies.[31] The Sudbury nickel mines increased output almost every year from 1905, the year the region became the world's leading producer.[32] The Spanish-American War (1898) and then the outbreak of World War I in 1914 boosted the demand for nickel. Overall production at the Sudbury mines and smelters doubled from 1914 to 1918.[33] The price of nickel also more than doubled from 1915 to 1916 alone. The local companies—Canadian Copper/INCO and Mond—and their shareholders correspondingly profited. Dividends skyrocketed.[34] The companies began to plan expansion and INCO opened its first Canadian refinery in 1918 in Port Colborne, Ontario. After a short postwar slump, nickel production increased again, in large part in response to growing use in the automotive industry and others.

In 1918 the newly formed International Nickel Company of Canada took over the mining and smelting operations in Copper Cliff, near Sudbury. It instantly became Canada's largest company.[35] Despite the name change, INCO remained an American-controlled not Canadian-controlled company. It bought out rival Mond Nickel in 1929. A monopoly of the Sudbury nickel deposits, however, eluded INCO when a new competitor, Falconbridge, scooped up some undeveloped claims and began operations.

Smelter and Roasting Nickel Ores

Nickel ore is messy stuff. The Sudbury ores not only contain a varying mix of nickel and copper but also much larger amounts of sulphur—again, a typical characteristic. How these ores are processed to produce nickel is an essential part of the story.

The original Sudbury processing method was neither unusual nor innovative. It mirrored methods conventionally used in the mineral industry as of the 1800s, but in Sudbury it remained in use until 1929. Technically a pyro-metallurgical process, it involved three steps once ores were hauled out of the ground: a "roasting" stage to reduce the amount of sulphur in the material, an intermediate smelting stage, and then a refining stage to separate and purify both the nickel and copper.

The roasting stage reduced the sulphur content of the ores significantly, from around 25 per cent to about 7 per cent, transforming sulphides in the ores to sulphur dioxide (SO_2) gas, or sulphur "fumes." This stage was preliminary but important. It not only reduced the bulk of the ores and lowered transportation costs, but also reduced smelting costs and increased the efficiency of the blast furnace smelters. According to Sudbury's first smelter manager, "Almost the entire success of the smelting process depends upon a good roast."[36]

Roasting in Sudbury was initially an open-air process, and primitive to say the least. The basic principles had not changed much since copper and then iron were first smelted, thousands of years ago. (The direct predecessors of blast furnaces installed in the Copper Cliff smelter in 1888 also dated back to medieval Europe and ancient China.) Roasting was done in large rectangular pits, referred to as "beds," typically one hundred feet in length, forty feet wide, and around eight feet deep. Dozens of individual beds made up an overall roast "yard." Workers would fill a bed with a well-stacked layer of cord wood three to five feet deep (obtained from the forests surrounding Sudbury), and cover it with a layer of raw ore, usually eight to thirteen feet deep, coarse ore on the bottom and fine ore on the top. They then lit the wood on fire. The process was exothermic; once the burning wood had raised the temperature of the ores sufficiently, sulphur continued to burn off on its own. It was a simple but slow process.[37] And it was not benign. Each heap smouldered continuously, day and night, normally for two to six months. The open-air roasting produced "dense, sulphurous clouds."[38] Since SO_2 is heavier than air, the clouds tended to hover at ground level until dispersed by winds, "much to the discomfort of the inhabitants," according to one industry source.[39] Relief from the fumes was seldom quick.

By the early 1920s Sudbury was open roasting, year in and year out, more than twice as much ore as any other smelting location

on the continent.[40] Its industries also discharged 300,000 tons of SO_2 per year.[41] Over the forty-year period from 1888 to 1928, the Canadian Copper–INCO operations smelted approximately 28 million tons of ore, producing approximately 8.4 million tons of SO_2.[42] From its earliest years as a mining-smelting area, Sudbury was not only the world's largest producer of nickel but also the continent's largest single source of SO_2 (a popular label critics belatedly gave it during the acid rain debates in the 1980s).

The very first roast yard was located near the original smelter in Copper Cliff, and stretched over half a mile.[43] By the early 1900s roast yards surrounded the smelter. These were later consolidated into one large yard approximately one mile from the town of Copper Cliff. Some, including the No. 2 yard, saw use for only a few years. Others, such as the huge O'Donnell yard, opened in 1916, lasted twelve years. INCO deliberately located it nine miles west of Copper Cliff, farther away from populated areas. The company was aided by a supportive provincial government that removed nearby tracts of land from agricultural use. As later became clear, however, the new roast yard was not far enough away from existing farms to prevent substantial damage to crops.

The Critics

A federal government report in the early 1900s maintained that, generally speaking, sulphur fumes "seem to have no injurious effect on man or beast." It nevertheless acknowledged certain problems. When the sulphur fumes are dense and accompanied by fog, "they produce a peculiar strangling or choking sensation" and sometimes bleeding of the nose—presumably not, said the report's author, an "injurious effect."[44] The report also lamely suggested people who live in polluted areas "miss the sulphur when removed to another place."

Visitors noticed the conditions and wrote about them. A Toronto reporter in 1902 described Sudbury "as one of the most unattractive places under the sun." Sulphur fumes from the roasting beds "have destroyed vegetation in the whole locality." The fumes have left "the rocky hills bare of trees and the streets and lawns innocent of a blade of grass."[45] "Imagine," he said, "every blade of grass, every leaf, every flower, blighted before it can be born by the sulphur reek." The smoke was, "in damp weather … so thick that one side of Sudbury's main street can't glimpse the other."[46]

In 1915, the government of Ontario appointed a royal commission to investigate the burgeoning nickel industry. It submitted its final report two years later.[47] The mission, in short, was to secure the expansion of the industry and its future success and not to solve its environmental problems. The commission focused on whether Ontario was internationally competitive as a producer of nickel and, in particular, whether Ontario nickel could be refined in the province itself. Predictably, the commissioners came to affirmative conclusions on both questions. "The Sudbury nickel industry," they noted with satisfaction, "has grown to be one of the great metal industries of the world."[48] It now accounted for 80 per cent of total world production of nickel, up from about 35 per cent in 1900. The commissioners also found "the methods employed at the Ontario plants of the two operating nickel companies are modern and efficient." That last claim was something of an overstatement, as the report itself went on to suggest.

A single report chapter considered the problem of sulphur emissions. There the commissioners allowed that "the roasting of ore in heaps is not the best or most efficient metallurgical practice," since "it involves losses of both nickel and copper."[49] Nor was the practice as effective in getting rid of sulphur as the amount of SO_2 given off by the roast beds might suggest. For the commission, as for the companies, the problem with the roast yards was more one of operating efficiency, overall production, and corporate profits than one of environmental damage and human health. Alas, in the commissioners' view, there was little to do. "While the subject has received attention from the operating companies," they noted, "it has not been found possible to make any economic use of the large quantities of sulphur that are thus wasted." The commissioners nevertheless suggested, rather in passing, that some of the "wasted" SO_2 emissions could be utilized to manufacture elemental sulphur or sulphuric acid. That suggestion fell on deaf ears.[50]

The commissioners were well aware that Norwegian smelters had already done away with open roast yards and that they commonly suspended their smelting operations entirely in the summer growing season. Both observations implied an acceptance of a link between SO_2 emissions and environmental damage. The commissioners also observed, gently, that Mond nickel had recently ceased using its roast yards during the summer months. Canadian Copper (then becoming INCO) had not followed suit. It continued to engage in year-round heap roasting for more than ten years.[51] The commissioners expressed their hope that "the injurious effects" of the Copper Cliff operations would be lessened by the recent consolidation of roast yards at the O'Donnell location, a hope soon proven unfounded. Beyond that, the commission touched very lightly on the environmental impacts of SO_2 emissions; it was at best a mild critic. It also made no mention of lawsuits from farmers proceeding then through the legal system—although the commissioners were undoubtedly well aware of the cases.

What royal commissions and Ontario governments were reluctant to address, the citizens of the Sudbury region took up with perhaps surprising zeal. James Orr, the founder of the *Sudbury Journal*, the original and highly influential local Sudbury newspaper, was far from a rabid critic of the nickel companies. Orr was also a founding member of the Sudbury Board of Trade, a close friend of J. F. Black's, and J. H. Clary's father in-law.[52] The *Journal*'s masthead proudly announced it was "devoted to the mining interests and development of the Nipissing and Algoma districts." In 1898, years before the royal commission, Orr nevertheless had attacked Canadian Copper for its lack of action to reduce atmospheric emissions. "Not one dollar has ever been expended by the … Company in an effort to abate

the nuisance of these sulphur fumes. Not one dollar has ever been expended to relieve the suffering of … women and children."[53] The newspaperman understood well the problem facing those seeking control action. The local populace, he said, were "wholly dependent upon this Company," and anyone "who raises a voice or hand against the imperious will of this corporation is certain to be … severely boycotted."[54]

The dominant group in Sudbury in these days were the businessmen, and they knew where their political interests lay. They also knew full well that the nickel mines and smelters had come to the rescue of Sudbury just as the impact of the railway was declining. As one business leader noted, "We all depend, not on the farmers from here … but directly upon the mines." The local business people—including of course the farmers themselves—thus live "in hopes that nothing would prevent the further development and finding of new mines."[55] Increased nickel production naturally meant not only more local business but also more roast yards and more fumes.

Yet by 1912 Sudbury area residents in some numbers, including these businessmen, were becoming fed up with the "fumes." The Sudbury Horticultural Society expressed concern, appointing a committee to bring up the problem with the city council, the Sudbury Board of Trade, and also A. P. Turner, president of the Canadian Copper Company.[56] James Orr's *Journal* went on the attack again. There was, it said, "scarcely a plant … not … affected by the deadly fumes." Indeed, trees appeared in the summer as if "visited by a heavy frost." A former resident of the company town that developed near the O'Donnell roast yard later recalled his childhood: "There were days when I could not see my hand in front of my face … I got lost one day walking the fifty yards to school. Needless to say, we had no gardens—there wasn't as much as a blade of grass growing in the village."[57] A Sudbury farmer's September 1915 letter to the *Journal* expressed frustration in vivid terms:

> Some say that the sulphur smoke does not do any harm to pasture land. Any man being on the road between Sudbury and Sudbury Junction, on the C.N.R. on Monday, August 23rd, could not help smelling the odor of dying vegetation, and on the following day, the fields were a rusty dying color, instead of a living green. Is that not sufficient proof of the damage being done by sulphur smoke, and I would therefore challenge any man with a head on his shoulders, a face on his head, and a nose on his face, to deny this fact. It is to be hoped the Canadian Copper Co. will sit up and take notice, and the farmers sit down and make a fair estimate of the damage, so as not to force said Company beyond a fair and agreeable settlement; that our alternative may not be law in itself but cultivated Justice.[58]

The damage to local agriculture was of particular interest to Sudbury's business community. The Sudbury Board of Trade's members were openly concerned about the damage to the local economy that would result if a substantial part of it, farming and the businesses tending to farmers' needs, no longer thrived in the area.[59] The local businesses had no recourse to a municipal smoke bylaw (to which so many other cities in North America resorted), because the sulphur fumes in the Sudbury area did not originate within city limits. The nickel industry was under the jurisdiction of the Ontario provincial government, and the latter manifestly did not share the Sudbury Board of Trade's concerns. Instead, and in lieu of municipal regulation, the local growth coalition tried to engage in a dialogue with the provincial government about the topic.

One issue arose in October 1915, after Canadian Copper announced it would move its operations to the large O'Donnell roast yard. The province obligingly removed from sale large tracts of land that the Board of Trade had previously anticipated would be sold to farmers. In doing so, the deputy minister of the Department of Lands, Forests, and Mines declared that the lots "cannot be considered fit for agriculture."[60] Members of the Board of Trade were livid. In a lengthy and dramatic 1 March 1916 Board of Trade special session where many issues related to the smoke nuisance were discussed, Clary declared that farmers are "the backbone of this or any other community" and called the province's assertion that the land was no good for growing "a damnable lie." He continued, "Why were those townships withdrawn? Simply to allow the two big smelting companies to use the most primitive methods of treating ore and also the cheapest so as to increase their profits."[61] Former Horticultural Society and Board of Trade president Black declared Sudbury "an agricultural district" and charged misrepresentation about the quality of the lands to government by "someone whose name [he was] not prepared to state." The Board of Trade considered a resolution censuring whoever had made the "false report" about the withdrawn lands, but decided against doing so and instead waited for the Royal Ontario Nickel Commission report and the province's larger vision for the region's development.[62]

On the issue of damage to farmland, the Board of Trade communicated with the provincial government, seeking to gather information and advocate for responses that would enable smelting and agriculture to coexist. In mid-March 1916, two weeks after its special session specifically on the smoke nuisance, the Sudbury Board of Trade raised the smelter smoke issue with Ontario Premier William Hearst (and a former minister of mines) and the local MPP, Charles McCrea. The board asked if the government had "taken any steps towards assisting the farmers in this district in connection with the adjusting of unsettled claims against the Canadian Copper Co. and the Mond Nickel Co., for damages arising from sulphur smoke and fumes." It further asked if the government had "taken any steps to prevent a recurrence of the damage done by sulphur smoke and fumes during the last year."[63]

Other discussions followed, with some discord about how to respond to the vexing problem. In mid-April 1916, another special session of the Board of Trade occurred, during which the organization considered a resolution "asking the Government

to compel the Canadian Copper Co. to remove its roast beds out of the district altogether." It did not pass. Another, which carried, sought to lighten the beleaguered farmers' burden, asking "that the government be requested to furnish the farmers of Sudbury District with the necessary seed for the year 1916." Another requested "the mining companies … consider roasting their ores between the months of October and April."[64] Both passed. Commenting on the meeting, the *Sudbury Star* observed, "Nearly everybody took a hand in the discussion and each succeeding speaker described himself as a champion of the farmer."[65] Black proposed a resolution stating, "This Board of Trade is of the opinion that the Government should appoint a Commission to take and keep all data with respect to sulphur smoke damage during the year 1916, in order to assist the farmers and others of the district."[66] This resolution also passed, and three members of the Board of Trade were sent to Toronto to lobby for the measure. After the visit, Black wired to the *Journal*, "Board of Trade and farmers deputation scores a strong point. Government agree to name a commission also give farmers seed grain."[67] A special investigator was appointed for 1916. Mond Nickel responded to the board's request to the mining companies and—as noted above—changed its roasting schedule to the winter months during 1916 and 1917, but Canadian Copper sought instead to address the issue with the opening of the O'Donnell roast yard that year.[68] The seed grain and roasting schedule change were at best minor palliatives, but Black's "commission" idea was later revisited and developed in the watershed 1921 legislation, discussed below.

The destruction of vegetation by sulphur fumes from the open-air roasting was in general never really denied by the companies and provincial government officials (although the companies often disputed specific claims, arguing that factors other than smelter fumes had damaged a particular crop). The Ontario Bureau of Mines itself collectively described the roast yards as "huge heaps of burning ore slowly exhaling tons of sulphur … withering every green blade within their influence."[69] The original Copper Cliff yard was dug amidst "a dense growth of spruce and birch trees." The trees, noted a company official, "fell before the stench." The roast yard, he added, "was quite a success."[70] But the fumes had an impact beyond the immediate vicinity of the yards and were felt throughout the area.[71]

Various authorities understated the impact of SO_2 fumes on residents, and thus sought to minimize the health effects. A general manager for Canadian Copper acknowledged the fumes could be "disagreeable" but suggested—without scientific proof—that they were "more beneficial than otherwise." Company workers, he said, "keep robust and healthy, with good appetites." Moreover, "there is an entire absence of consumptive diseases among permanent residents." One visiting observer insisted the fumes "have no ill effects on men or animals." Indeed, the children of the Sudbury mining towns seemed "plump and rosy."[72] An INCO publication, the *Triangle*, would later argue that the townsfolk "got used to" the pollution.[73] Indeed, the author went on to suggest, "It was rumored maybe the sulphur smoke wasn't all that bad." As residents of pulp and paper mill towns across Canada used to say, their air pollution was "the smell of money."

Sudbury Court Cases

Farmers in the Sudbury region began taking action about the crop damage within a few years of the smelter and roast yards' coming into being. An informal complaint resolution process operated during 1909 to 1914, with the local sheriff acting as arbitrator. It dealt with hundreds of complaints and did so apparently to the satisfaction of both the farmers and companies.[74] In 1915, the frequency of crop damage incidents increased sharply, as did the number of complaints. Both were the result of the significant expansion of nickel production and the growing number and use of roast yards during the First World War.[75] A three-person committee took over arbitration after a mounting number of complaints, in the hundreds, overwhelmed the sheriff's office. This mechanism quickly "produced intense dissatisfaction" amongst farmers, due to the new committee's tendency to offer very modest compensation.[76] Citing this problem, a deputation of farmers attended the 1 March 1916 special session of the Sudbury Board of Trade, accompanied with a petition signed by seventy-two farmers from twelve neighbouring townships, asking for the organization's "sympathy and support toward a readjustment and solution of the 'sulphur nuisance,' both as regards the past and future."[77]

The aggrieved farmers also turned to the courts—as James Orr, the *Journal* editor, had suggested they should do.[78] Their legal weapon was the common law of nuisance, which protects owners' rights to enjoy their property free from interferences and allows for court injunctions against such interference. The result was what one of the judges involved described as a "large number" of lawsuits. Many more were "threatened."[79] The plaintiffs, he noted, "represent a large constituency," and the total of damages claimed "must be a very large sum."[80]

The courts, plaintiffs, and defendants agreed to put a subset of these lawsuits together, as a test case, in what became known as Black et al v Canadian Copper Company.[81] The relevant suits eventually came before the courts in 1916–1917.[82] Four plaintiffs (Black, Belanger, Taillifer, and the Sudbury and Copper Cliff Dairy) were suing Canadian Copper, but two of the six suits were against Mond Nickel (those by Clary and Ostroski). Other legal actions remained in abeyance.

The selected plaintiffs represented a range of affected interests. As noted above, Black was an influential local businessman who had founded the Sudbury Horticultural Society (1911–1912) and served as president of the Sudbury Board of Trade (1912–1914, 1915).[83] Belanger was a farmer, on "a somewhat larger scale than usual" for the Sudbury district, and Taillifer "a woman who worked also upon two farms … in a humbler way." The dairy operated a farm, near Copper Cliff, where it pastured its herd.[84] Clary was a local barrister and another Board of Trade member, who would argue other lawsuits in court, and himself owned a farm.[85] He had told the 1 March 1916 Board of Trade meeting that in the last year "he had not raised a bushel of grain worth

replanting and not a ton of hay that any 'self-respecting horse or cow would eat.'"[86] The Ostroskis had a small farm to supply vegetables for the boarding house they owned and operated. Some of the plaintiffs blamed the new O'Donnell roast yard for the damage their lands received in 1916.[87]

All of the plaintiffs in Black et al v Canadian Copper had originally sought injunctions against the companies to end the emissions or at least render them less harmful. However, the trial judge, Mr. Justice Middleton, early on refused to contemplate injunctions. Perhaps being realistic, the plaintiffs abandoned that objective and focused on compensation for damages. As the cases wound up, the *Sudbury Star* (with Orr's retirement, then the city's largest daily), reflected on the historic scale of the endeavour: "The mass of evidence, number of exhibits and cost of litigation is unprecedented in local court annals. Over one thousand pages of evidence has passed through the court stenographer's hands while there was close on two hundred exhibits, requiring several large boxes for shipment when the cases were transferred to Toronto for the hearing of expert evidence."[88]

Justice Middleton's 1917 written judgment makes clear he saw few remedies at hand for the problem. He believed the companies faced four constraints: they had no alternative to using roast yards to produce nickel; they had no choice but to operate roast beds year-round; they could not sell sulphur by-products; and they could not continue to operate profitably if any sort of restrictions were placed on their emissions. These claims, though frequently made by the smelting companies themselves, were highly debatable, and some were demonstrably erroneous, even as they were uttered. Smelters elsewhere had adapted and were adjusting their operations to minimize crop damage during the summer growing seasons. Norwegian companies had long ago entirely phased out their use of roast yards, as had the Cominco smelter in Trail, British Columbia. American smelters had already survived production restrictions to reduce air pollution, and similar controls were soon to be applied to the Trail smelter.[89] And the Sudbury smelters themselves soon began recovering some sulphur from their emissions.

In any case, according to Middleton, the matter at hand in Black et al was "to ascertain what damage, if any, has been done by the omission [*sic*] of the smoke vapours from the roast beds and smelter stacks."[90] The companies did not contest that their emissions could be harmful to farms, under certain conditions. Dodging the general point, they argued in court that such conditions did not exist in the specific cases and that crop problems there were due to causes other than SO_2.

Justice Middleton appears to have largely agreed with the scientific experts who testified for the defendants (the smelter companies) or provided evidence favourable to them. On the basis of direct testimony, however, from witnesses who had seen SO_2 fumes over the farms and directly observed near-immediate effects on the crops, Middleton accepted that SO_2 "fumes" likely had caused harm to some extent. He also noted that the gases from the roasting process destroyed all vegetation in the immediate area of the roast beds. His judgment ordered compensation for damage incurred over two years. Black himself received $1,000, Clary $1,400, Sudbury and Copper Cliff Dairy $1,000, Taillifer $800, Belanger $750, and Ostroski $500. These amounts, while not trifling for the time, were notably less than the out-of-court settlements the companies had offered the plaintiffs prior to the trial.[91] The companies appealed the awards, but lost at the appellate court level.[92]

While the Black et al case has gained more attention in the contemporary legal literature,[93] an essentially parallel Sudbury court case is at least as interesting historically. The five plaintiffs in Lindala et al v Canadian Copper Company "contended that the condition of the various crops … was due to the action upon them and upon the soil … of the smoke and fumes from the works of the Company … and there is further claim that the use of the waters of streams upon the plaintiffs' lands … became injurious to man and beast."[94] As an early statement of the ecosystem effects of air pollution, this is notably broad, encompassing as it does claims of damage to vegetation, soil, and waterways.

As in the Black case, defence counsel argued the damage to the plaintiffs' crops was either the result of disease or minor in scale. The district court trial judge, Justice Kehoe, a founding director of the Horticultural Society and close acquaintance of Sudbury's business community, countered those arguments. He suggested that, whatever the general health of the crops, it was obvious they "would not have benefitted from gas visitations." He also noted the crop yields were much less than in previous years, despite favourable weather. Ultimately, the observed cause-and-effect relationship seemed unassailable. "The crops of these several plaintiffs were smoked and gased [*sic*] by smoke from the roast beds of these defendants, and … blight therefrom was immediately visible after."[95] Two scientific experts backed up the testimony of witnesses, arguing essentially that the problem in essence was not "fumes" per se but rather acidification stemming from the airborne SO_2 and water vapour, being transformed on the plants into sulphuric acid.[96] These scientists were thus talking about a version of what came in the 1970s to be called "acid precipitation."

Contrary to the Black et al case, where Justice Middleton seemed unpersuaded by much of the scientific evidence, Judge Kehoe seemed to find the expert arguments convincing. So too did the justices of the appeals court, most notably Justice Hodgins, who accepted Kehoe's judgement "that sulphur smoke streams did reach these lands as described by those who said that they saw them, and also that the plaintiffs in each case suffered damage by the injury caused to their farms."[97] The Canadian Copper Company appealed Kehoe's decision, which it claimed was "contrary to evidence and against the weight of evidence."[98] Its appeal was denied.

The government of Ontario was already worried about the impending court cases; now it had to face the prospect of a

flood of judgments against the smelters. One of the judges involved in the court cases called for a thorough scientific study of the problem. Kehoe called for "a remedy that would do away with the wide litigation and the consequent great expense" and warned that "a whole countryside in continual lawsuits is in every way a great bane to the community." He expressed "the hope that in some way this condition will be avoided."[99] Even more worrisome for the Ontario government perhaps was that a future court might do what Justice Middleton had shied away from doing—impose an injunction against the operations of the companies. The Black and Lindala cases had raised but not settled the injunction issue, and subsequent cases similarly sought injunctions.[100] As predicted, more lawsuits were filed, twenty in 1920 alone.[101] In September 1920, Judge Kehoe testified before the Ontario Public Service Commission with the stated hope of bringing an end to the "everlasting litigation." Maintaining that both mining and farming were "essential to the prosperity of the district," Kehoe advocated for "the appointment of a resident commissioner at Sudbury who would devote his entire time to the settling of claims as far as was in his power," and who would "act as an intermediary between the farmers and the nickel companies."[102] This proposal was notably similar to what the Board of Trade had requested four and a half year earlier.

The government's response to the litigation was predictable but uncustomarily quick. It moved to protect the nickel companies, rushing through the legislature the "Damage by Fumes Arbitration Act" (SO 1921, c 85). The 1921 act created a dedicated sulphur fumes arbitrator to settle claims against the smelters, as Kehoe had requested. However, the farmers could not appeal the arbitrator's rulings. The act also prohibited further court cases and thus ended the threat of injunctions. It was also retroactive and thus set aside the wave of pending lawsuits. The farmers, in short, lost their legal weapon. A 1924 amendment to the act (RSO 1924, c 76) made the Department of Mines rather than Agriculture responsible for the arbitration process. The wolf's best friend—if not the wolf itself—was now in charge of the chicken coop.

Sudbury's business community generally recognized that its long-term prosperity rested primarily with mining and smelting, notwithstanding efforts within the Board of Trade to reconcile those operations with the needs of its farmers. After the court cases and the new provincial legislation, the Board of Trade passed a resolution requesting that the provincial government appoint a resident mining engineer for Sudbury.[103] It also advocated, publicly, and during a visit to the provincial capital, Toronto, that the government lower taxes on the nickel industry. In a typical article entitled "Board of Trade Is Optimistic as to Future," the *Sudbury Star* quite excitedly declared its hope: "The Mining Recorder's office is thronged with people every day asking questions, buying licenses and recording claims, [Board of Trade member] Mr. [J.G.] Henry said. The country in the region of Wahnapitae Lake was being staked very rapidly and mining men of note who had visited the district were greatly impressed. From a business standpoint merchants were already beginning to feel the benefit of the influx."[104]

It would be decades before Sudbury's nickel smelters were eventually forced to reduce their emissions. Meanwhile, the number of farms in the Sudbury region declined steadily after World War I and continued to drop through the 1920s and 1930s.[105]

Conclusion

The case of smelter fumes in Sudbury during the 1910s provides a mixed example of the involvement of local elites in environmental politics. Unlike the mono-industrial Gary, Indiana, of the 1960s, discussed in Matthew Crenson's classic text, *The Un-Politics of Air Pollution*, Sudbury's more diverse (mining and agricultural) economy entailed the need for a managed solution.[106] Air pollution was problematized as a serious threat to local economic prosperity by some in the city's elite, rather than a fact of life that everyone should simply live with. That elite was not of one mind, however. The issue of smelter "smoke" caused a rift between those in the resource city who saw the mining industry and its associated smelters as the key source of local jobs and thus essential to the local economy, and those who were affected by the sulphur "smoke" and saw a need to find a resolution that would allow both agriculture and the nickel industry to continue. Thus the Board of Trade entered cautiously into the political fray. Its most significant suggestion was for the provincial government to establish a commission, which eventually developed into a process to compensate farmers.

The Ontario government, strongly favouring one of the province's major industries, would place no formal restrictions of any sort on the Sudbury smelters, either to protect the region's farm crops or to improve local air quality in general. Neither the courts nor the government insisted the Sudbury companies phase out their roast yards, or even suggested it, although other jurisdictions had done so before the 1920s. The "smoke" damage arbitration process it created was, however, reasonably effective. It provided a means of quickly compensating affected farmers directly for those crops the arbitrator judged to have been damaged, without the necessity of court proceedings—and, of course, without the prospect of injunctions against the offending industry and its essential product. The compensation ordered by the arbiter, however, was not always fair to the farmers.

The Sudbury area's "smoke" problem was eventually somewhat reduced in the 1920s through a change in industrial technology. The use of open-air roasting was slowly phased out. From a single roast pit in Copper Cliff in the 1890s, the numbers had proliferated to more than eighty individual roast yards by early twentieth century. Most of these yards (80 per cent) were closed by 1925. Mond Nickel had ceased all open roasting of ores in 1918. INCO followed suit a decade later, converting its operations to more modern reverberatory furnaces that did not require pre-roasting ores. When the mammoth O'Donnell roast yard closed in 1928, it was an industrial dinosaur, the last of its

kind and the end of an era.[107] The process of removing sulphur from Sudbury's nickel ores thus moved indoors, but the SO_2 emissions continued, of course. And local air quality—and local farms—continued to suffer. The impact of the fumes on the local area was alleviated only partially by the use of industrial stacks, that grew taller as the decades passed, and ultimately by the infamous 380-metre INCO "superstack" built in the early 1970s.

Above we presented two potential explanations for this failure to arrive at an elite-formulated policy response to the smoke problem that would improve air quality. The first, highlighted by recent historical studies of air pollution policy, is the presence or absence of known economical control technology enabling firms to lessen pollution without impact on their production and thus damaging their bottom line and the local economy. As we show, this was not the case in Sudbury during the 1910s. Remedies for the damaging effects on crops of sulphur emissions from open-air roast yards were available by the time of the Sudbury environmental protests.[108] Changes were made elsewhere without seriously imperilling the profitability of smelters, let alone endangering their viability or forcing them to close down. These remedies ranged from abandoning open-air roasting in favour of more modern smelting processes, to converting SO_2 exhaust gases to elemental sulphur or manufacturing sulphuric acid or fertilizer, to varying smelter operations according to wind and weather conditions, to limiting emissions during the growing season. In contrast, all of these approaches were applied in the case of the Cominco smelter in Trail, British Columbia, and other smelters.

The second (and more convincing) explanation for Sudbury and the Board of Trade's failure is jurisdictional reach, coupled with the organization's lack of consensus about more stringent measures. Indeed, jurisdictional reach was a perennial challenge in urban air pollution abatement in Canada for many decades. To take one example, during the mid-1920s to early 1930s, the Montreal Board of Trade advocated for (and obtained) a modern municipal air pollution bylaw with an objective emissions standard, technological controls, and a staffed municipal pollution control office. Yet during the process of drafting the bylaw, the Montreal Board of Trade had to compromise with the national railroad industry, which reminded the drafters that locomotives and freighters were within the exclusive jurisdiction of the federal government. The bylaw, while an improvement on what existed prior, thus failed to regulate one of the city's main polluters.

In Sudbury there were no illusions that the city could force or encourage the local smelters to lessen emissions.[109] The mining and smelting industry, regulated by the provincial government, dominated the local economy to such an extent that an elite consensus on the need to reduce emissions was much more difficult to obtain than in larger, more economically diverse cities such as Montreal. The Sudbury Board of Trade was internally divided on measures to balance mining/smelting and agriculture and could not reach that sort of consensus. Those of its members most ardently dedicated to protecting farming in the region took the polluters to court, on their own. The board requested the smelting companies change their roasting calendar (unsuccessfully, with Canadian Copper) and sought help in the form of seed grain for the farmers from the Ontario government. More importantly, it requested (and obtained) the creation of a provincial commission with a special sulphur fumes investigator. While the board likely played a role in an ostensible victory for farmers in terms of a compensation process, what the province created a few years later proved to be a very modest reform.

Notes

1 Formally, the Sudbury district is the land immediately surrounding the city of Sudbury, and extending to the northwest of the urban area. It was created in 1907 and, during the 1910s (and since), the terms *Sudbury* and *Sudbury district* were often used interchangeably. However, the Sudbury district and the smelters were outside the administrative reach of Sudbury's municipal government. See Oiva W. Saarinen, *From Meteorite Impact to Constellation City: A Historical Geography of Greater Sudbury* (Waterloo, ON: Wilfrid Laurier University Press, 2013), chap. 3.

2 The urban regime perspective is well represented by Roger Friedland, *Power and Crisis in the City: Corporations, Unions, and Urban Policy* (New York: Schocken, 1983); Martin Shefter, *Political Crisis/Fiscal Crisis: The Collapse and Revival of New York City* (New York: Columbia University Press, 1992); Stephen L. Elkin, *City and Regime in the American Republic* (Chicago: University of Chicago Press, 1987); and Clarence N. Stone, "Urban Regimes and the Capacity to Govern: A Political Economy Approach," *Journal of Public Affairs* 15, no. 1 (1993): 1–28.

3 Harvey Molotch, "The City as a Growth Machine: Toward a Political Economy of Place," *American Journal of Sociology* 82, no. 2 (September 1976): 310.

4 Clyde W. Barrow, "State Theory and the Dependency Principle: An Institutionalist Critique of the Business Climate Concept," *Journal of Economic Issues* 32, no. 1 (1998); George Gonzalez, *The Politics of Air Pollution: Urban Growth, Ecological Modernization, and Symbolic Inclusion* (Albany, NY: SUNY Press, 2005), 2.

5 In particular, Ted Moore, "Democratizing the Air: The Salt Lake Women's Chamber of Commerce and Air Pollution, 1936–1945," *Environmental History* 12, no. 1 (January 2007): 80–106; Gonzalez, *Politics of Air Pollution*; Owen Temby, "Trouble in Smogville: The Politics of Toronto's Air Pollution during the 1950s," *Journal of Urban History* 39, no. 4 (July 2013): 669–689; Owen Temby and Ryan O'Connor, "Property, Technology, and Environmental Policy: The Politics of Acid Rain in Ontario, 1978–1985," *Journal of Policy History* 27, no. 4 (October 2015): 636–669.

6 See the introduction to this special issue for more details on air pollution political history and growth coalitions.

7 Molotch, "City as a Growth Machine," 315.

8 Ibid., 315–316.

9 Temby, "Trouble in Smogville"; and Gonzalez, *Politics of Air Pollution*.

10 Saarinen, *From Meteorite Impact to Constellation City*, chap. 5.

11 Ibid., 70–72. For additional accounts of Sudbury's development during the first two decades of the twentieth century, see Ashley Thomson, "1900–1910," and Matt Bray, "1910–1920," in *Sudbury: Rail Town to Regional Capital*, ed. C. M. Wallace and A. Thomson (Toronto: Dundurn, 1993), 58–112.

12 The Board of Trade reported ninety-six paid members in 1913. "President Black Reviews Year's Work of the Board of Trade," *Sudbury Star*, 24 January 1914. One notable example of an elected official's participation is J. G. Henry, elected as president of the Board of Trade in 1919, after serving as mayor in 1912 and 1913.

13 "Dr. Morrison is President Trade Board," *Sudbury Star*, 30 January 1918.

14 Charles Dorian (as Pundit Joe), "Old-Timer Tales," *Sudbury Star*, 15 April 1953, in *Chronological and Subject Indexes to Old-Timer's Columns, Sept. 2, 1952—Dec. 31, 1960*, Mary C. Shantz Local History Collection, Greater Sudbury Public Library.

15 For biographical overviews of portions of Black's life, see Dorian, "Old-Timer Tales," *Sudbury Star*, 13, 15, and 17 April 1953, in *Chronological and Subject Indexes to Old-Timer's Columns*.

16 Saarinen, in *From Meteorite Impact to Constellation City*, 82, refers to Bell as a "lumber baron and public benefactor" and identifies him among the city's elite. Brodie's role in founding the Sudbury Public Library Association in the 1910s is discussed in Bray, "1910–1920."

17 Gonzalez, *Politics of Air Pollution*.

18 Temby and O'Connor, "Property, Technology, and Environmental Policy."

19 For an example of the Board of Trade's reorientation towards growth through the mining and refining industries, see "Board of Trade Is Optimistic as to Future: Better Times Making Appearance on Horizon," *Sudbury Star*, 13 May 1922.

20 Dorian, "Old-Timer Tales," *Sudbury Star*, 27 June 1953, in *Chronological and Subject Indexes to Old-Timer's Columns*.

21 This is often referred to as the "Sudbury Event." See Saarinen, *From Meteorite Impact to Constellation City*, chap. 1.

22 See, for example, Gilbert Stelter, "Community Development in Toronto's Commercial Empire: The Industrial Towns of the Nickel Belt, 1883–1931," *Laurentian University Review* 6 (June 1974): 6.

23 T. F. Sutherland, "Mining Methods at Creighton," Report to the Ontario Nickel Commission, extracted in *Canadian Mining Journal* 38 (15 April 1917): 178–180.

24 Rhonda Telford, "'The sound of the rustling of the gold is under my feet where I stand; We have a rich country': A History of Aboriginal Mineral Resources in Ontario" (PhD diss., University of Toronto, 1996).

25 Jamie Benedickson, "Sudbury, Nickel and INCO: Early History," *Alternatives* 2 (Spring 1973): 6.

26 Ibid., 6, citing an 1853–56 report of the Geological Survey of Canada.

27 Like iron, nickel is "ferromagnetic," although nickel-steel alloys are not, essentially as the result of the mixture. Today's "nickel" coins are not magnetic because they are no longer made of nickel.

28 Wotherspoon, "Nickel Ore Mining in Sudbury District," 118.

29 V. N. Hybinette, "Development of Nickel Refining Process," *Canadian Mining Journal* 38 (15 June 1917): 251–256.

30 E. D. Loney, "Some Account of the Early History of the Nickel Industry." The U.S. Navy first ordered nickel for its ship-building program in 1890. Benedickson, "Sudbury, Nickel and INCO," 7.

31 E. D. Loney, "The Nickel Industry: Some Further History," *Canadian Mining Journal* 50 (18 January 1929): 50–52.

32 Noel Beach, "Nickel Capital: Sudbury and the Nickel Industry, 1905–1925," *Laurentian University Review* 6 (June 1974): 58–59, table 2.

33 "Large Increase in Ontario's Metal Production," *Canadian Mining Journal* (1 December 1916): 555.

34 Returns on investment in 1916 were roughly 28 per cent. "International Nickel Co.," *Canadian Mining Journal* 37 (1 February 1916): 66.

35 Donald N. Dewees and Michael Halewood, "The Efficiency of the Common Law: Sulphur Dioxide Emissions in Sudbury," *University of Toronto Law Journal* 42 (1992): 9.

36 E. D. Peters, "The Sudbury Ore-Deposits," *Transactions of the American Institute of Mining Engineers* 18 (May 1889–February 1890): 278–289.

37 For an INCO photograph, circa early 1900s, showing one of the roast yards being prepared, see Peter Nosko, "Sudbury's Abandonned Roast Yards," 2007, http://sudbury-mining-environment.ca/2007Presentations/Session%204%20-%20A/5%20Peter%20Nosko.pdf.

38 Stelter, "Community Development in Toronto's Commercial Empire," 14.

39 A. R. Jones, "The International Nickel Co. of Canada Ltd," *Canadian Mining Journal* 42 (18 November 1921): 9–11.

40 Stelter, "Community Development in Toronto's Commercial Empire," 14.

41 "Report of the Ontario Nickel Commission," *Canadian Mining Journal* 38 (15 April 1917): 173. For a photograph from that era of the Victoria roast yard with fumes coming off a burning bed, see Bill Bradley, "Victoria Mines Roast Yard: West of Sudbury," 13 June 2008, Republic of Mining, http://www.republicofmining.com/2008/06/13/digging-through-the-sudbury-soils-study-by-bill-bradley/victoria-mines-roast-yard-west-of-sudbury/.

42 Benedickson "Sudbury, Nickel and INCO."

43 E. D. Peters, "The Sudbury Ore-Deposits," *Transactions of the American Institute of Mining Engineers* 18 (May 1889 to February 1890): 278–289.

44 A. E. Barlow, *Report on the Origins, Geological Relations and Compositions of the Nickel and Copper Deposits of the Sudbury Mining District* (Ottawa, 1904), 192.

45 "Manitoulin and North Shore Railway: Mining and Farming in Algoma," *Globe*, 12 October 1902. Cited by Dewees and Halewood, "The Efficiency of the Common Law" and quoted in Matt Bray, "The Province of Ontario and the Problem of Sulphur Fumes Emissions in the Sudbury District," *Laurentian University Review* 16, no. 2 (February 1984): 82.

46 Report from the *Toronto Star*, reprinted in the *Sudbury Journal*, 16 October 1902, and cited by Gilbert A. Stelter, "The Origins of a Company Town: Sudbury in the Nineteenth Century," *Laurentian University Review* 3 (February 1971): 28.

47 "Report of the Ontario Nickel Commission," *Canadian Mining Journal* 38 (15 April 1917): 168–173.

48 Ibid., 169.

49 Ibid., 172.

50 Canadian Copper/INCO had no interest in reclaiming sulphur prior to the early 1900s. It refused an offer from Francis Clergue, an industrialist from Sault St. Marie, to buy waste sulphur for use in his sulphite paper mill. Benedickson, "Sudbury, Nickel and INCO," 8.

51 INCO tended to use roasted ore sitting in the roast yards as "reserves." Beach, "Nickel Capital," 58. In other words, roasting was not a "just in time" operation. The company's insistence that it had to engage in summer roasting is therefore highly questionable.

52 Dorian, "Old-Timer Tales," *Sudbury Star*, 13 April 1953, in *Chronological and Subject Indexes to Old-Timer's Columns*.

53 James Orr, *Sudbury Journal*, 17 August 1899, quoted by Stelter, "Origins of a Company Town," 28–29. The journal began publishing in 1891 and ceased publication in 1918. The reasons for its demise, other than Orr's decision to retire, are not known.

54 Orr, *Sudbury Journal*, 17 August 1899.

55 John Frawley, letter to the editor, *Sudbury Journal*, 16 April 1891, cited by Stelter, "Origins of a Company Town," 19.

56 "Want Action Taken re Sulphur Nuisance," *Sudbury Journal*, 10 October 1912; Dorian, "Old-Timer Tales," *Sudbury Star*, 17 April 1952, in *Chronological and Subject Indexes to Old-Timer's Columns*.

57 INCO*, Triangle* 34 (October 1974), http://www.sudburymuseums.ca/triangle/data/INCOTriangle-19741001.pdf.

58 Farmer, letter to the editor, *Sudbury Journal*, 2 September 1915.

59 Outgoing Board of Trade president J. F. Black spoke about the importance of

agriculture to Sudbury's economy in his January 1914 address. "President Black Reviews Year's Work of the Board of Trade." For an overview of Sudbury's economic diversity in the 1910s, and the substantial place of agriculture within it, see Bray, "1910–1920"; and Saarinen, *From Meteorite Impact to Constellation City*, chaps. 8 and 9.

60 "Solution of Sulphur Smoke Problem Has Been Evolved," *Sudbury Journal*, 30 October 1915.

61 "Farmers of 'Smoke Zone' Ask Sympathy and Support of Sudbury Board of Trade," *Sudbury Star*, 4 March 1916.

62 Ibid.

63 "Board of Trade," *Sudbury Journal*, 16 March 1916.

64 "Sulphur Smoke Deputation Will Go to Toronto," *Sudbury Star*, 19 April 1916.

65 Ibid.

66 Ibid.

67 "Board of Trade," *Sudbury Journal*, 20 April 1916.

68 Bray, "1910–1920."

69 *17th Report of the Bureau of Mines, Ontario* (Toronto, 1908), cited by Beach, "Nickel Capital," 57.

70 LeBourdais, 52, cited by Noel Beach, "Nickel Capital," 57; and Stelter, "Origins of a Company Town," 14.

71 While winds in the Sudbury area blow more often from the southwest to northeast, they also frequently blow in other directions.

72 Ontario Bureau of Mines Report, 1903, 299–300, cited by Stelter, "Community Development in Toronto's Commercial Empire," 12.

73 INCO*, Triangle* 34 (October 1974).

74 Lindala et al v Canadian Copper Company, in the District Court of the District of Sudbury, 16 June 1917, p. 4, Complaints 1917, box 1, RG13-31, Archives of Ontario.

75 "Solution of Sulphur Smoke Problem Has Been Evolved," *Sudbury Star*, 30 October 1915.

76 Lindala et al v Canadian Copper, p. 4. See also "Sulphur Smoke Deputation Will Go to Toronto," *Sudbury Star*, 19 April 1916.

77 There are two accounts of this dramatic meeting, one in each of Sudbury's newspapers. "Farmers of 'Smoke Zone' Ask Sympathy and Support of Sudbury Board of Trade," *Sudbury Star*, 4 March 1916; "Board of Trade," *Sudbury Journal*, 9 March 1916.

78 *Sudbury Journal*, 22 and 29 August 1912, 1 and 4.

79 "Copy of Judgment of Middleton," 31 May 1917, p. 1, box 2, RG 80-6-0-22, Archives of Ontario.

80 Ibid., 4. For additional details on these cases and the amounts sought by plaintiffs, see "2 Sulphur Cases Feature Docket Division Court," *Sudbury Star*, 20 September 1916; "Say Fences Destroyed," *Sudbury Journal*, 19 October 1916; "Damage, but How Much, Is Point to Decide," *Sudbury Star*, 28 October 1916; "More Sulphur Cases Filed in District Court," *Sudbury Star*, 18 November 1916; and "Awards in Sulphur Cases Disappointing to Plaintiffs," *Sudbury Star*, 2 June 1917.

81 See also Bray, "Province of Ontario and the Problem of Sulphur Fumes Emissions"; Dewees and Halewood, "Efficiency of the Common Law"; and Jennifer Nedelsky, "Judicial Conservatism in an Age of Innovation: Comparative Perspectives on Canadian Nuisance Law 1880–1930" in *Essays in the History of Canadian Law*, ed. David Flaherty (Toronto: University of Toronto Press, 1981), 1:281–322.

82 The first sessions of Black et al v Canadian Copper took place in March 1916.

83 See, also, Bray, "1910–1920."

84 "Copy of Judgment of Middleton," 1.

85 "Sulphur Smoke Brings Writs in High Court," *Sudbury Star*, 29 September 1916.

86 "Farmers of 'Smoke Zone' Ask Sympathy and Support of Sudbury Board of Trade," *Sudbury Star*, 4 March 1916.

87 Lindala v Canadian Copper, 1. In legal proceedings, nuisance complaints can be weakened if the industry in question preceded other uses, on the grounds that the property owners knew or should have known their lands were nearby an existing source of a nuisance. Courts take the principle of "prior location of industry" into consideration in determining the "reasonableness" of the polluter's conduct. Contrary to what readers might infer from Dewees and Halewood ("Efficiency of the Common Law"), farms in the Sudbury area had preceded the establishment of certain roast yards, particularly the O'Donnell yard. Plaintiffs in the Black case were affected by the "greatly extended" capacity of existing roast yards and by new yards ("Statement of Claim," J. F. Black and the Canadian Copper Company, 16 September 1915, box 22, RG84-6-0-22, Archives of Ontario; Tailiffer v the Canadian Copper Company, 1915, Statement of Claim, box 1380, RG22-5000, Supreme Court of Ontario, Sudbury). Later complaints about tree damage also came from property owners who pre-dated the smelters and roast yards (for example, Gravelle case in "Complaints 1926," box 2, RG 13-31-0-7.1, Archives of Ontario).

88 "Final Windup Sulphur Cases Start Monday," *Sudbury Star*, 3 March 1917.

89 By the time INCO commenced operation of the new O'Donnell roast yard in 1916–1917, Norwegian smelters had abandoned use of such yards and were curtailing smelter operations during the summer. Dewees and Halewood, "Efficiency of the Common Law," 14. American smelters as well as the Cominco plant in Trail continued to operate profitably after restrictions were placed on operations.

90 "Copy of Judgment of Middleton," 2.

91 "Awards in Sulphur Cases Disappointing to Plaintiffs"; and Dewees and Halewood, "Efficiency of the Common Law."

92 See, for example, Appellate Division, Taillifer v Canadian Copper Company and Other Cases, Copy of Judgment, 19 January 1920, reel MS 1663, Drury Administration, RG3-4-0-211, Archives of Ontario.

93 Dewees and Halewood, "Efficiency of the Common Law"; Nedelsky, "Judicial Conservatism."

94 Appellate Division, Arthurs, David, Giroux, Lindala, and J. Lindala [Lindala et al] v Canadian Copper Company, p. 6, Copy of Judgment of Appellate Division, reel MS 1663, Drury Administration, RG3-4-0-211, Archives of Ontario.

95 Ibid.

96 Testimony of Dr. Ruttan, Lindala et al v Canadian Copper Company, Appellate Division and First Divisional Court, Province of Ontario, 1918, pp. 2 and 9, box 2, RG 84-6-0-25, Archives of Ontario. Early studies of SO_2 damage in the United States include J. K. Haywood, *Injury to Vegetation by Smelter Fumes*, United States Department of Agriculture, bulletin 89, 1904; and Haywood, *Injury to Vegetation and Animal Life by Smelter Wastes*, United States Department of Agriculture, bulletin 113, 1910; United States, Department of Interior, *Report of Selby Smelter Commission*, bulletin 98, 1915.

97 The text of Kehoe's judgment is quoted from "Awards Made in Five Sulphur Smoke Actions," *Sudbury Star*, 18 July 1917; and "Sulphur Cases in District Court," *Sudbury Journal*, 19 July 1917.

98 "Appeal in Sulphur Smoke Cases," *Sudbury Journal*, 23 August 1917.

99 Lindala v Canadian Copper, 5; also, "Awards Made in Five Sulphur Smoke Actions," and "Sulphur Cases in District Court."

100 "Injunction Is Sought to Stop Open Roasting," *Sudbury Star*, 19 March 1919; and "Two Appeals Are Dismissed," *Sudbury Star*, 17 March 1920.

101 Bray, "Province of Ontario and the Problem of Sulphur Fumes Emissions";

see also "Premier Pays Hurried Visit to Sudbury's Farming District," *Sudbury Star*, 24 July 1920; and "Will Again Call Experts," *Sudbury Star*, 15 December 1920.

102 "Advocates a Commissioner," *Sudbury Star*, 15 September 1920.

103 "Board of Trade Is Optimistic as to Future: Better Times Making Appearance on Horizon," *Sudbury Star*, 13 May 1922.

104 Ibid. Wahnapitae Lake is now called Lake Wanapitei and is fully contained within Sudbury's municipal limits.

105 On the basis of Canadian census data, Saarinen estimates a 30 per cent drop in the number of farms in the Sudbury area from 1921 to 1931. See Saarinen, *From Meteorite Impact to Constellation City*, 149.

106 Matthew Crenson, *The Un-Politics of Air Pollution: A Study of Non-Decisionmaking in the Cities* (Baltimore: Johns Hopkins University Press, 1971).

107 Sources, respectively, E. D. Peters, "The Sudbury Ore-Deposits," *Transactions of the American Institute of Mining Engineers* 18 (May 1889 to February 1890): 278–289; Matthew Bray, "Province of Ontario and the Problem of Sulphur Fumes Emissions," 81; Beach, "Nickel Capital," 72n12.

108 For an example, see R. E. Swain, "Atmospheric Pollution by Industrial Wastes," *Industrial & Engineering Chemistry* 15 (1923): 296–301.

109 Notably, the meeting minutes of Sudbury's city council are silent on the issue of smelter smoke fumes from 1915 through 1920. Town of Sudbury, Minutes 13 July 1914 to 23 July 1918; and 5 August 1918 to 4 October 1920, files ON00120 026-1-6 and ON00120 026-1-7, box M-041, fonds 026—Town of Sudbury, City of Greater Sudbury Archives.