

## Textual Economies and the Presentation of Statistical Material: Charts, Tables and Texts in 19th Century Public Education

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Résumé de l'article

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# Textual Economies and the Presentation of Statistical Material: Charts, Tables and Texts in 19<sup>th</sup> Century Public Education

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**Abstract:** This exploratory article develops the notion of textual economy, to investigate the place of statistical representations in practices of knowledge production. Nineteenth century Canadian state agencies generated massive quantities of statistical information. Yet, techniques of graphic representation were largely absent from official state papers and reports. The article investigates the discursive and textual strategies adopted by state servants to draw on statistical information in the absence of graphic representation.

**Résumé :** De caractère exploratoire, cet article examine la place des représentations graphiques dans les pratiques de production du savoir au moyen de la notion d' « économie textuelle ». Pendant le 19<sup>e</sup> siècle, les organismes de l'État canadien génèrent de gigantesques quantités d'informations statistiques. Pourtant, ni les documents ni les rapports officiels n'adoptent des techniques de représentation graphique. Cet article étudie les stratégies discursives et textuelles qu'utilisent les fonctionnaires pour mettre à profit les informations statistiques en l'absence de telles techniques.

In 1887, as his contribution to the celebrations surrounding Queen Victoria's Golden Jubilee, Canada's official statistician, George Johnson, published what he claimed was a state-of-the-art demonstration of the beauties of graphical statistical representation entitled *Johnson's Graphic Statistics*.<sup>1</sup> In this exploratory article, I take Johnson's book as a point of departure for some reflections on the ways one might pursue a study of the production, representation, and manipulation of quantitative information in the late Victorian Canadian state system. I draw on the Annual Reports of the Education Departments of Quebec, and more especially Ontario, in a sketch that attempts to give empirical substance to these reflections. The article connects literatures on scientific representation, the history of social science and statistics, and state formation. It examines some aspects of the textual economy employed by government

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1. George Johnson, *Johnson's Graphic Statistics* (Ottawa: Privately Printed, 1887).

administrators and points to the place of statistical material in it. "Textual economy" refers to the ways in which the presentation of information and the creation of knowledge result from the ordered relations among devices such as images, tables, charts, graphs, or photographs, and descriptive or explanatory text.

By the second half of the nineteenth century, Canadian administrators were generating masses of statistical material, far more than they could use practically or afford to print. The technical capacity of the state system to produce knowledge of social conditions outstripped the capacity of state administrators for analysis and policy formation. The Canadian state system was not different from its European and American contemporaries in this regard. Still, I argue that Canadian administrators were laggard in their use of techniques of visual representation for ordering quantitative information and for presenting it to the public. Educational administrators, nevertheless, used statistical representations in their Annual Reports and drew selectively on statistical information in argument and analysis. The article points to some of the ways they did so in the absence of graphic devices.

Practices of representation are a well-developed object of investigation in various kinds of science studies. The translation of the complexities of social relations and conditions onto the flat surface of text is one path to scientific and technical mastery, as well as something that facilitates action at a distance. Stylized and simplified representations of variegated empirical objects or situations can effectively orient action in desired directions, guide projects of mastery, or facilitate identification. Representations, it is acknowledged, even in such realist modes as photography, are not simple reflections, but objects that contribute to the constitution and specification of that which is represented.<sup>2</sup> Visual representation blends aesthetics, utility, and politics, and a specialized literature

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2. For instance, Geoffrey Bowker and Susan Leigh Star, *Sorting Things Out: Classification and Its Consequences* (Cambridge, Massachusetts: MIT Press, 1999); Alexander Butchart, *The Anatomy of Power: European Constructions of the African Body* (London: Zed Books, 1998); Kate Burningham, "A Noisy Road or a Noisy Resident? A Demonstration of the Utility of Social Constructionism for Analysing Environmental Problems," *The Sociological Review* 46, 3 (1998): 536-563; Nelson Goodman, *Ways of Worldmaking* (Indianapolis: Hackett, 1978); Ian Hacking, *The Social Construction of What?* (Cambridge, Massachusetts: Harvard University Press, 1999); Ian Hacking, *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science* (Cambridge: Cambridge University Press, 1983); Bruno Latour, "Visualization and Cognition: Thinking with Eyes and Hands," *Knowledge and Society: Studies in the Sociology of Culture Past and Present* 6 (1986): 1-40; Paul Tibbetts, "Representation and the Realist-Constructivist Controversy," in *Representation in Scientific Practice*, eds. Michael Lynch and Steve Woolgar (Cambridge, Massachusetts: MIT Press, 1990), 69-84.

concerns how best to ensure that aesthetic features increase rather than decrease conveyed information.<sup>3</sup> Visual representation is held to be political in the common sense of allowing the few to speak for the many, of silencing the many so that the few may speak.

Sometimes overlapping the literature on scientific representation is a large and rapidly growing literature on the history of statistics. Contributors to this literature probe the interrelated changes in mentalities, state administrative structures, and everyday relations that underpin the development of statistics as a mode of knowledge. The formation of bureaucratic state agencies and the interest of private individuals contributed to a massive production of statistical material, especially from the decades of the 1820s and 1830s. More or less systematic observation and recording of empirical conditions in standardized categories called new objects and relations into existence and made them potentially the focus of action. New sciences and quasi-sciences emerged in tandem with these new phenomena: political economy, moral economy, social economy, social science, and sanitary medicine, but also phrenology and eugenics. These sciences spoke in new languages in which quantitative information was often invoked.<sup>4</sup> The immanent connection between statistics as a

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3. E.R. Tufte, *Envisioning Information* (Cheshire, Connecticut: Graphics Press, 1990).
4. J.-P. Beaud and J.-G. Prévost, "La structuration de l'appareil statistique canadien, 1912-21," *Canadian Historical Review* 74, 3 (1993): 395-413; J.-P. Beaud and J.-G. Prévost, "La forme est le fond: la structuration des appareils statistiques nationaux (1800-1945)," *Revue de synthèse* 4, 4 (1997): 419-456; J.-P. Beaud and J.-G. Prévost, "Back to Quételet," *Recherches sociologiques* 2 (1998): 83-100; M.-N. Bourguet, *Déchiffrer la France: la statistique départementale à l'époque napoléonienne* (Paris: Éditions des archives contemporaines, 1988); Éric Brian, *La mesure de l'État: administrateurs et géomètres au XVIII<sup>e</sup> siècle* (Paris: Albin Michel, 1994); P.C. Cohen, *A Calculating People: The Spread of Numeracy in Early America* (Chicago: University of Chicago Press, 1982); J. Cole, *The Power of Large Numbers: Population, Politics, and Gender in Nineteenth-Century France* (Ithaca: Cornell University Press, 2000); A.W. Crosby, *The Measure of Reality: Quantification and Western Society, 1250-1600* (Cambridge: Cambridge University Press, 1997); Bruce Curtis, *The Politics of Population: State Formation, Statistics, and the Census of Canada, 1840-75* (Toronto: University of Toronto Press, 2001); M. Donnelly, "Statistical Classifications and the Salience of Social Class," in *Reworking Class*, ed. J.R. Hall (Ithaca: Cornell University Press, 1997), 107-131; G. Emery, "Ontario's Civil Registration of Vital Statistics, 1869-1926: The Evolution of an Administrative System," *Canadian Historical Review* 64, 4 (1983): 468-493; L. Goldman, "Statistics and the Science of Society in Britain: A Social Context for the G.R.O.," *Social History of Medicine* 4, 3 (1991): 415-434; Ian Hacking, "Biopower and the Avalanche of Printed Numbers," *Humanities in Society* 5 (1982): 279-295; Ian Hacking, *The Taming of Chance* (Cambridge: Cambridge University Press, 1990); V.L. Hilts, "Aliis extendum, or, the Origins of the Statistical Society of London," *Isis* 69 (1978): 21-43; R. Lenoir, "Savoirs et sciences d'État: généalogie et démographie," *Actes de la recherche en sciences sociales* 133 (2000): 96-97; D. Mackenzie, *Statistics in*

mode of knowledge and its objects is well expressed by Alain Desrosières, who writes that systematically generated statistical information can only become an operational possibility when it becomes feasible to work in harness with administrative practices and structures that give a sufficient degree of necessary basic order and recognized codification to the social world, something that is an essential preliminary for statistical recording processes to work.<sup>5</sup>

Beyond a certain level of simplicity, the production of statistical information demands the formation of organizations able to order relations and practices in the world that is to be known.

Historically, the fabrication of social order susceptible to statistical appropriation proceeds unevenly across different domains. In the case of Victorian central Canada, the education departments led the way. These agencies had been administering large population segments for almost half a century by the time Johnson published his book and had precisely organized and codified relations in a social world they helped to transform. As the first large scale Canadian social agencies, they were precocious in many areas of administrative techniques and practices, promoting the first professional examinations, conducting regular financial audits, organizing pension funds, and employing full-time trained inspectors. They re-codified social relations, working up new distinctions between children and adults, between public and private space, between parental and governmental authority. They sought to standardize modes of self-understanding and self-expression, through disciplined instruction in techniques of speaking, reading, writing and proper relations to text. They changed life trajectories for people in Canada, both by connecting social maturity to the orderly passage through the school system and by fostering the reality of 'a career' for teachers and others. The departments generated masses of statistical material and produced annual reports in

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*Britain, 1865-1930: The Social Construction of Scientific Knowledge* (Edinburgh: Edinburgh University Press, 1981); S. Patriarca, *Numbers and Nationhood: Writing Statistics in Nineteenth-Century Italy* (Cambridge: Cambridge University Press, 1996); Theodore M. Porter, *The Rise of Statistical Thinking 1820-1900* (Princeton: Princeton University Press, 1986); Stuart Woolf, "Statistics and the Modern State," *Comparative Studies in Society and History* 31, 3 (1989): 588-604; Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1996); P. Starr, "Social Categories and the Liberal State," in *How Classification Works: Nelson Goodman among the Social Scientists*, eds. M. Douglas and D. Hull (Edinburgh: Edinburgh University Press, 1992), 154-179.

5. Alain Desrosières, "Official Statistics and Medicine in Nineteenth-Century France: the SGF as a Case Study," *Social History of Medicine* (1991): 515-537.

which it was presented and analyzed for public consumption.<sup>6</sup> They did not use graphic representations.

The publication of *Johnson's Graphic Statistics* initially provokes two fairly straightforward empirical questions: were his techniques in fact 'state-of-the-art' in relation to the visual representation of quantitative information? And were they 'state-of-the-art' in the Canadian state system? I begin by answering the first question in the negative. I then show that the answer to the second question is slightly more ambiguous. This demonstration leads me to outline a program for the investigation of the development of statistical representations, and then to examine the representational techniques adopted by a large government department in portraying and analyzing important quantities of statistical information.

### Graphic Statistics

Apart from an introductory paragraph and the captions attached to its figures, Johnson's book had no written text. It presented a mixture of bar and line graphs that dealt almost exclusively with economic statistics: reports of the products of agriculture, forestry, mining, exports and imports, and other dimensions of trade and commerce. These were the main subjects of interest to the Department of Agriculture and Statistics headed by Johnson. Some of the material was comparative for several decades. Johnson's graphs were perhaps striking for their size, for a number extended across more than one leaf of the book. They were also coloured, presumably by hand. In addition to its line and bar graphs (figure 1), the book also contained a few handsome engraved pictorial graphs representing—in this period of intense agitation for temperance—the apparently startling growth of alcohol and tobacco consumption in Canada (figure 2).

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6. See Bruce Curtis, *Building the Educational State: Canada West, 1836-1871* (London, Ontario and Sussex, England: Althouse Press and Falmer Press, 1988); Bruce Curtis, *True Government by Choice Men? Inspection, Education, and State Formation in Canada West* (Toronto: University of Toronto Press, 1992); R.D. Gidney and W.P.J. Millar, *Inventing Secondary Education: The Rise of the High School in Nineteenth-Century Ontario* (Montreal and Kingston: McGill-Queen's University Press, 1990); Susan Houston and Alison Prentice, *Schooling and Scholars in Nineteenth-Century Ontario* (Toronto: University of Toronto Press, 1988).

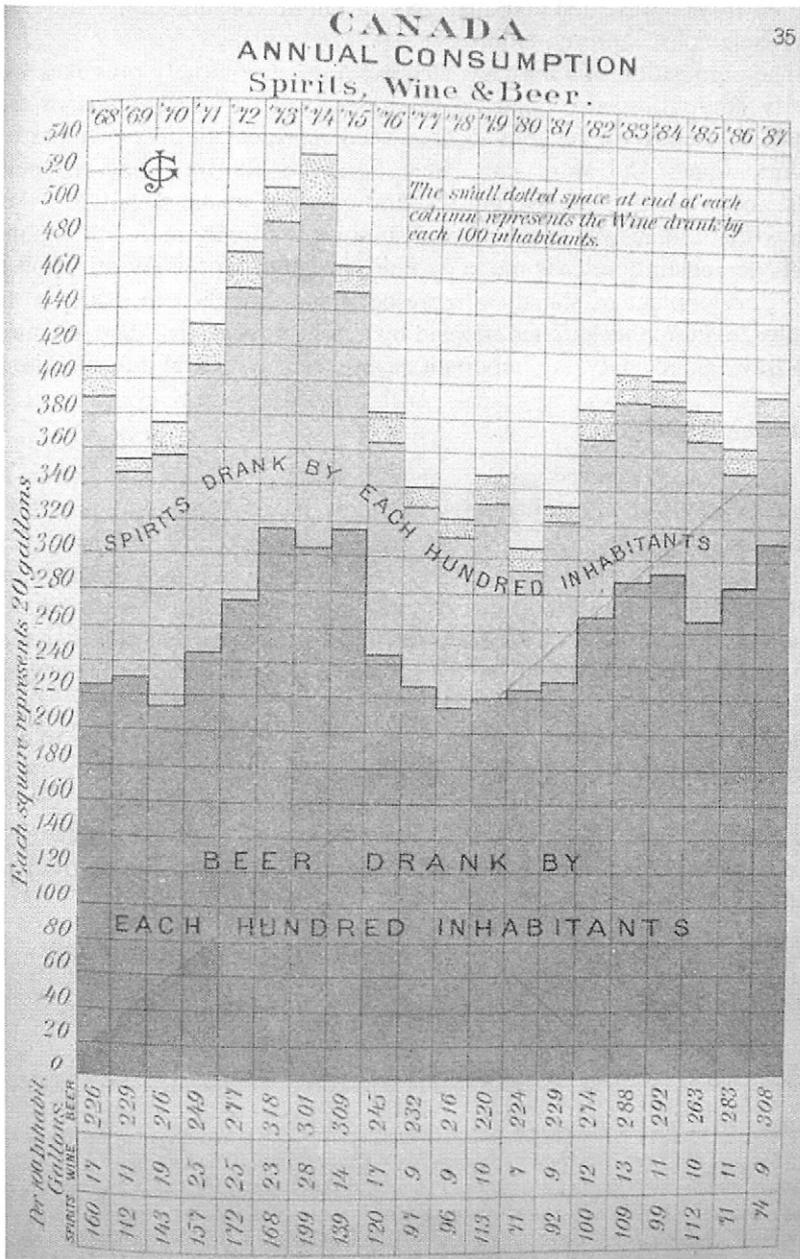


FIGURE 1. "Canada: Annual Consumption: Spirits, Wine & Beer"  
(Reprinted from Johnson 1887, page 35)

A few bar graphs had appeared in the European scientific literature of the late seventeenth and early eighteenth centuries, but the publication in which they first figured prominently was William Playfair's 1786 *The Commercial and Political Atlas*. Playfair justified their use by claiming that the rapid increase in human knowledge and the pressing occupations of men of business made it necessary to abbreviate and to present general information to them quickly and easily. Playfair's *Statistical Breviary* of 1801 was the first to present economic and demographic data in graphic form, and he also made use of circle graphs and pie charts. Daniel Headrick suggests that graphic statistical representation made little headway in the first half of the nineteenth century in England, despite its popularity on the continent.<sup>7</sup> Nonetheless, representational devices such as the pie chart and the thematic map were appearing in English parliamentary papers and reports relatively early. Florence Nightingale's 1850s reports on army hospitals, for instance, contained pie charts and graphs whose authorship has been attributed to the deputy Registrar-General William Farr, a leading statistician.<sup>8</sup>

In the United States, by contrast, sophisticated forms of graphic and cartographic statistical representation were employed in government reports at least as early as the 1870s. Johnson's earlier American counterpart, the census superintendent, Francis Amasa Walker, published the *Statistical Atlas of the United States*, based on the 1870 census results, in 1874 and the book was widely distributed. There was relatively regular communication and cooperation between the American and Canadian census offices, and it is almost certainly the case that Johnson's office possessed a copy of Walker's *Atlas*. Walker used a large number of coloured thematic maps, double-sided (or pyramid) graphs, pie charts, circle graphs, and complex rectangular graphs to present census results and to establish correlations among them. The six volumes of Canadian census reports on the 1871 census, by contrast, contained no graphs or maps.<sup>9</sup>

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7. D.R. Headrick, *When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution, 1700-1850* (Oxford: Oxford University Press, 2000), 123-134.

8. J.M. Eyler, *Victorian Social Medicine: The Ideas and Methods of William Farr* (Baltimore: The Johns Hopkins University Press, 1979), 158.

9. See M.G. Hannah, *Governmentality and the Mastery of Territory in Nineteenth-Century America* (Cambridge: Cambridge University Press, 2000) for Walker. Joseph-Charles Taché did undertake a remarkable cartographic exercise and noted in his reports on the 1871 census that the Department of Agriculture's census maps could be consulted by interested members of the public: see Curtis, *Politics of Population*, 274-305.

**Tobacco Consumed in Canada.** 37

Each Square Represents 6000 Pounds

**In Ontario each 1000 Persons in the 19 Years of Confederation have used**

**(34,400 Pounds of Tobacco)**

<b>In Quebec</b>	<b>45,600.</b>	"	"	"
" <b>New Brunswick</b>	<b>41,300.</b>	"	"	"
" <b>Nova Scotia</b>	<b>32,240.</b>	"	"	"
" <b>P.E. Island</b>	<b>26,730.</b>	"	"	"
" <b>B. Columbia</b>	<b>57,836.</b>	"	"	"

and in **Manitoba & North-West 49,514.**

in all Canada the Average has been **42,200 Pounds** for each 1000 Persons for 19 Years Tobacco using

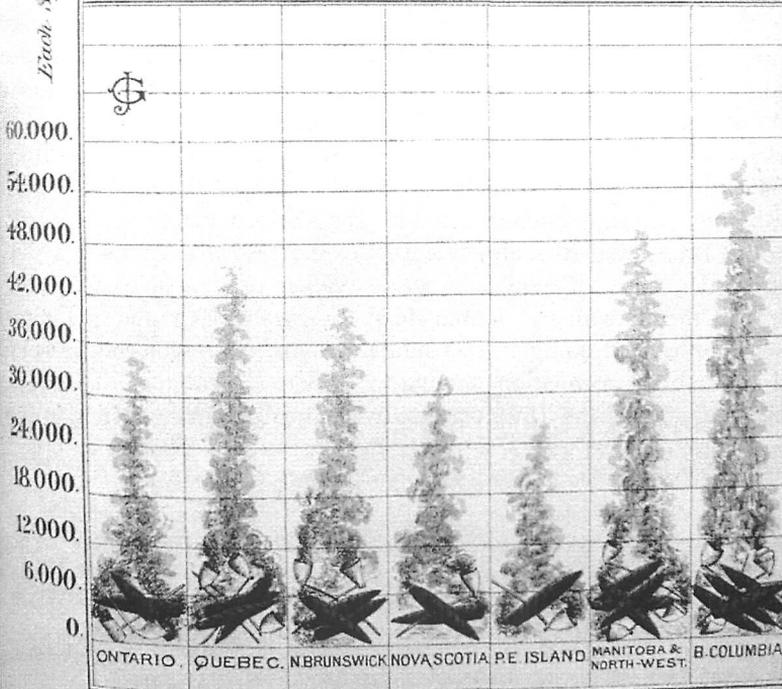


FIGURE 2. "Tobacco Consumed in Canada"  
(Reprinted from Johnson 1887, page 37)

George Johnson's representational work, then, lagged behind material produced by some of his American and continental counterparts, material to which he had likely been exposed. Yet it does not seem to have lagged behind general Canadian government practice; from this point of view his graphs were unusual. In no federal government report to Parliament published in 1887 was there a graph. An examination, at five year intervals beginning with 1842, of all Canadian parliamentary *Sessional Papers* revealed no examples of graphic statistical representation: tables, lists, charts and text did representational work. For some purposes, government departments and agencies did make use of a wider range of visual representations. For instance, the *Journal of Education for Upper Canada* regularly presented line drawings of schoolhouses and furniture; the Department of Agriculture and Statistics' *Canada Farmer* reproduced images of log cabin construction, of binders and threshing machines, and its pamphlets for prospective immigrants were heavily engraved. Moreover, by the 1870s urban Canadians had access to an illustrated press. Yet, as far as I can determine, no government department used anything other than charts, tables, and lists to present quantitative information in its official reports to Parliament. For all practical purposes, these devices did the work of representation for statistical material.

While my concern is to examine how administrators dealt with statistical information using a limited repertoire of devices, and not to account for the apparent lag in Canadian representational practice, the absence of printed graphic statistics may simply be a result of fiscal restraint by the parliamentary Printing Committee. In his Annual Report of 1874, the Ontario Chief Superintendent of Education Egerton Ryerson noted in reference to the meteorological reports made by the grammar school observatories: "In my Report of 1867, the results of most of the observations were presented in the form of synchronous curves, but as the expense proved an objection, a synopsis is now given in figures." In fact, the education report for 1867 did not print any such "curves." Printing anything that could not easily be set in type was expensive in nineteenth century Canada, and printing had been by far the largest expense involved in running Parliament.<sup>10</sup> Further research might find additional evidence. My question here, however, is not, why there were no graphic representations in official state papers but, rather, how quantitative information was presented to the public and used by administrators in the

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10. Province of Ontario, *Sessional Papers: Annual Report of the Normal, Model and Public Schools of Ontario for the Year 1874*, No. 3 (1874), 13. On parliamentary printing, see Bruce Curtis, "Selective publicity and informed public opinion in the Canadas, 1841-1856," *History of Education Review* 27 (1998): 1-19.

absence of such forms of visual representation. What were administrators able to do with the statistics they generated? I take up these questions in a preliminary manner using the case of public educational administration. The research question is obviously an ambitious one and calls for far more extensive research than I report on here. I suggest how one might undertake such research, illustrating these suggestions with material from the educational departments.

### **Towards a History of Strategies of Representation**

An exhaustive history of the development of the representational strategies invoked in official statistical documents might follow five lines of enquiry. Because statistical knowledge depends upon the fabrication of order in social (or physical) domains, one would begin by reconstructing the political, legal and bureaucratic (or technical-scientific) incursions that led to the translation of relations, practices and conditions into official statistics, and then would chart the development of such incursions across different parts of the state system.<sup>11</sup> There would follow an examination of the textual disposition of statistical information in government documents, and the purposes it served. Changing modes of representation would be included here. Fourth would be an investigation of the kinds of social calculus in which descriptive statistics was implicated, and finally one would investigate the timing, the conditions and the consequences of the shift from descriptive to inferential statistics. The mathematisation of statistical investigation and the development of representative sampling which condition the transition to inferential statistics are developments of a later period than the one with which I am concerned. Using the other four lines of investigation as a rough guide, I point to increasing conceptual sophistication in the work of educational observers and analysts in the period ending with the late 1880s.

### **Public Schooling and Statistical Production**

For reasons peculiar to Canadian political-economic development, public schooling was the leading nineteenth century project for social government. It sought to group political subjects together across their civil differences in new, locally based, semi-autonomous institutions of discipline and tutelage. Educational administration was characterized by a considerable degree of centralization in juxtaposition to the regulated autonomy of a network of local officials. Provincial education offices

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11. For instance: Bruce Curtis, "From the Moral Thermometer to Money: Metrological Reform in pre-Confederation Canada," *Social Studies of Science* 28, 4 (1998): 547-570.

regulated matters ranging from the training and certification of teachers, and the definition of the curriculum and the sale and distribution of textbooks, through to the financial audit of local accounts and the design of proper school buildings. Local representative government bodies—municipal councils and corporations of school trustees—taxed to fund the system and were in charge of its day-to-day management and execution.<sup>12</sup>

The public educational bureaucracies were important sites for administrative innovation. Many practices later generalized to the Canadian state system as a whole—and in some cases beyond it—originated here: examination and certification of professionals; regular financial audit of local agencies; periodic inspection by trained agents of the central authority; the regular circulation of a monthly publication to all officials in the system; and the creation of the first Canadian employees' pension fund, among them. The educational project gave rise to and depended upon a network of central/local relations through which central authorities attempted to regulate distant sites and to manage the sometimes violent opposition provoked by the radical social transformations implied in state schooling. Such “action at a distance” was sustained in part by direct personal contact between central administrators or their delegates and local officials. Central authorities also undertook a large number of attempts to standardize conditions and practices in localities by the diffusion of exemplars—trained teachers, appropriate books, approved apparatus, and so on.<sup>13</sup> However, the most continuous and effective links between center and locality were textual: formalized practices of reading, writing, and reporting. Regular and compulsory examination and reporting practices constrained students, teachers, trustees, inspectors and municipal officials to translate local conditions into standard textual inscriptions and to send these to the central authority.

Formalized social practice, including systematic social observation, depends upon “investment in forms.”<sup>14</sup> The public schooling project was

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12. Curtis, *Building the Educational State*; Bruce Curtis, “Mapping the Social: Jacob Keefer’s Educational Tour, 1845,” *Journal of Canadian Studies* 28, 2 (1995): 51-68.

13. Joseph O’Connell, “Metrology: The Creation of Universality by the Circulation of Particulars,” *Social Studies of Science* 23 (1993): 129-173.

14. Bruce Curtis, “Social Investment in Medical Forms: The 1866 Cholera Scare and Beyond,” *Canadian Historical Review* 81, 3 (2000): 347-379; Alain Desrosières, “Histoire de formes: statistiques et sciences sociales avant 1940,” *Revue française de sociologie* 26 (1985): 277-310; Alain Desrosières, “How to Make Things Which Hold Together: Social Science, Statistics and the State,” in *Discourses on Society: The Shaping of the Social Science Disciplines*, eds. Peter Wagner, Björn Wittrock and Richard Whitley (Dordrecht: Kluwer Academic Publishers, 1990), 195-218; Laurent Thévenot, “Rules and Implements: Investment in Forms,” *Social Science Information* 23, 1 (1984): 1-45.

launched through a set of formal investments that defined the administrative contours of the educational domain and that formalized practices within it. The school laws and administrative regulations specified procedures for the delimitation of school districts, and put in place a one-district-one-school rule, thereby superimposing an educational administrative grid or template upon the colonial territory. The school laws made the receipt of the public school grant by a school district or section conditional upon the delivery of an annual report on approved forms. Central officials acted early in the development of the system to distribute copies of such forms to every school district and the faithful completion of them in the prescribed manner by teachers was subject to examination by school inspectors in the course of the school year.

This systematic formal investment of relations and conditions involved the creation and disposition of a system of classification and categorization that defined relevant objects of observation. Indeed, if one were to push this analysis further, one would see that the classification system acquired its own momentum, expanding the breadth and increasing the depth and density of its coverage as subdivisions and correlations were introduced. New objects of knowledge and objects for action emerged: crude enrollment numbers became rates of attendance divided by age and sex. Names of books used were displaced by an official curriculum with subject divisions. Then numbers of students by age and sex were related to subjects studied and mapped onto an urban/rural divide. Again, crude measures of the conditions of schoolhouses were systematized as reports of construction materials and physical dimensions. Relating such reports to average attendance made it possible to calculate the volume of air available to each student and to act on the health of bodies through the medium of the schoolhouse. These examples could be multiplied, but the point is that a considerable array of objects and practices were translated into numerical accounts and shipped to a central body. A new domain of knowledge and new practices of knowledge production resulted. The central authority effectively became a "center of calculation," commanding a "cascade of inscriptions" produced by a large network of observers. The education offices were thus placed to collect, sort, order, scale, and synthesize accounts of local conditions and to use such representations of schooling in pursuit of their own projects. In ways exactly parallel to the scientific laboratory, the administrative laboratory discov-

ered new objects and built upon them to extend its own purchase on the material world.<sup>15</sup>

Over the course of the first half-century of the educational project, its administrative activity became both increasingly extensive and intensive. The project gave rise to an enormous documentary system through which tens of thousands of pieces of correspondence circulated annually. Central administrators were constrained to innovate in order to manage such material effectively. To be able actually to use it to intervene pointedly in localities, they had to sort and classify it, to standardize it and to regulate its movement. Already in the late 1850s, for instance, letter writers were instructed as to how to compose letters to the Education Department and each item of incoming correspondence was inserted into a standard cover, sorted according to date, source, and subject matter, with the number and date of the letter of reply indicated.<sup>16</sup>

This massive official documentary system was produced and managed by a very small number of provincial government employees. In 1860, about the middle of the period with which I am concerned, the staff of the Education Office in Canada West consisted of the chief superintendent, his deputy, two clerks, an accountant, an assistant salesman (for the School Book Depository), and a messenger. The sister office in Canada East was said to contain the chief superintendent, his secretary, six clerks and a messenger.<sup>17</sup> By contrast, in 1855, the big government departments, such as Crown Lands, the Inspector-General's office (i.e. finance) and the Post Office, contained 25, 16, and 15 clerks respectively at the seat of government, apart from their administrative heads.<sup>18</sup> Nonetheless, an examination of the official documentary system across the period of investigation shows that the two education offices together produced a volume of documentation that consistently surpassed most other departments of state, with the Education Office (West) usually considerably more prolific than its eastern counterpart. By 1872, after a new School

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15. See Latour, "Visualization and Cognition," and T. Osborne and N. Rose, "Do the Social Sciences Create Phenomena? The Example of Public Opinion Research," *British Journal of Sociology* 50, 3 (1999): 367-96.

16. The organization of the archive means that the researcher must often read against the grain of the official classifications; a letter from a school trustee marked "schoolbook request" may also include requests for direction about some local matter. See Bowker and Star, *Sorting Things Out*.

17. National Archives of Canada, Record Group 1, Executive Council Office of the Province of Canada Fonds, E13 (hereafter NAC, RG1, E13), The Canada Blue Book for 1860.

18. NAC, RG1, E13, the Canada Blue Book for 1855. See also Bruce Curtis, "Comment dénombrer les serviteurs de l'état au Canada-Uni: Essai méthodologique," *Revue d'histoire de l'Amérique française* 46, 4 (1993): 607-628.

Act made provision for the creation and administration of public high schools in addition to the existing network of public elementary schools, the (still) Chief Superintendent of Education in the Province of Ontario could report that his small staff at the seat of government was supervising a network that included 4,661 public elementary and 104 public high schools, attended by 454,662 and 7,968 students respectively and taught in by 5,476 teachers.<sup>19</sup>

### Across the State System

The schooling project created observational infrastructures and a very large corps of trained, literate observers in advance of other state agencies. Both observational practices and observers themselves migrated to other parts of the state system and beyond its limits. Normal Schools for teacher training supplemented the very limited opportunities in central Canada for a college education. A very high proportion of graduates used their teacher's certificate as a means to find employment outside the school system. Trained teachers and inspectors especially were mobile throughout the government bureaucracy, while other state agencies attempted to draw on the observational capacity of the school system for their own administrative projects. For instance, in the late 1850s, the secretary to the Bureau of Agriculture, Registration and Statistics, William Hutton, himself a former school teacher and school inspector, estimated Canadian population growth by applying multipliers to the returns of school age children provided by the education offices. His estimates were taken up and used as the basis for allocating certain state monies and for locating government offices. Again, after the 1860 International Statistical Congress recommended that countries use large numbers of enumerators and many very small enumeration districts when taking a census, Hutton attempted to use school sections as districts and school teachers as enumerators for the 1861 census.<sup>20</sup>

Moreover, the grammar, and subsequently the public high schools served as meteorological observatories. There was no Canadian counterpart to the Greenwich observatory in the period in question, but systematic observation of the weather was seen as a pressing contemporary

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19. Province of Ontario, *Sessional Papers*, No. 3 (1874), "Annual Report of the Normal, Model, High and Public Schools of Ontario, for the Year 1872." On the growth of the Canadian official documentary system more generally, see Bruce Curtis, "Official Documentary Systems and Colonial Governance: From Imperial Sovereignty to Colonial Autonomy in the Canadas, 1841-1867," *Journal of Historical Sociology* 10, 4 (1997): 389-417.

20. See Curtis, *Politics of Population*, 171-196.

necessity. Under the dominant “miasmatic” or sanitarian view of disease, the noxious vapors exuded by decaying vegetable matter, stagnant water and human filth, which were held responsible for disease, were believed to be responsive to changes in temperature, humidity, air pressure, and unusual climatic events. Attempts were made to correlate disease outbreaks with thunderstorms, strong winds and severe heat. During the 1866 cholera scare, the secretary to the colonial Board of Health agitated for the keeping of regular meteorological records. Grammar school masters had been enlisted in the 1860s to make such observations and, by 1872, the Chief Superintendent of Education in Ontario was reporting detailed yearly observations from 10 sites in categories such as temperature, humidity, and barometric pressure, as well as the “amount of cloudiness” and the amount of rain and snow.<sup>21</sup>

On the other hand, Canadian school officials increasingly drew on observational resources from other government departments and from other governments in pursuit of their own specifically educational projects. For instance, as a domain in which administrative authorities had considerable leverage over relations, conditions, and practices, schooling was readily susceptible to projects for temperance and social sanitation. Thus, Egerton Ryerson’s 1872 Ontario report invoked the U.S. Commissioner of Education’s citation of the 1870 U.S. census report on child mortality in an argument for the construction of healthy school-houses.<sup>22</sup> With his detailed reports of schoolhouse dimensions and average attendance, Ryerson could calculate the volume of air available to the average student, or to a particular student in a particular school.

### Lists, Tables, Texts

Work in social studies of scientific knowledge has been concerned with the ways in which both claims to knowledge and “truth effects” in docu-

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21. “The High School system of Ontario secures the continuous residence of a class of men, at different points, who are well qualified by education to perform the work of observation, and the law authorizes the establishment and maintenance of a limited number of stations, selected by the Council of Public Instruction, with the approval of His Excellency the Lieutenant Governor, at which daily observations are taken of barometric pressure, temperature of the air, pressure of vapour, humidity of the air, direction and velocity of the wind, amount of cloudiness, rain, snow, auroras, and other meteoric phenomena,” Province of Ontario, *Sessional Papers: Annual Report of the Normal, Model and Public Schools of Ontario for 1874*, No. 3 (1874), 154-8. On sanitary medicine and statistics, see Curtis, “Social Investment in Medical Forms,” and Bruce Curtis, “Sanitary Medicine and the Social Body: the Case of National Civil Registration and Statistics in Canada, 1855-75,” *Canadian Bulletin of Medical History* 21, 1 (2004): 73-101.

22. Province of Ontario, *Sessional Papers: Annual Report of the Normal, Model and Public Schools of Ontario for 1874*, No. 3 (1874), 56-7.

mentary sources are organized mechanically through the disposition and juxtaposition of representational devices and textual arguments. I use "textual economy" to refer to this phenomenon, which is modeled on Law and Whittaker's investigation of an environmental policy document produced by a late twentieth century Swedish government. In this document, photographs and stylized drawings were enlisted to support claims that acid rain was a problem demanding attention and intervention. Uncaptioned photographs of cascading streams in bright sunlight were interspersed with textual descriptions of the effects of acid rain on lakes and rivers. Drawings were included of exhaust streaming from automobile tail pipes, and fumes from factory chimneys rising into a sky, where they became giant molecules labeled with their chemical names, before combining to form acid precipitation and falling to earth again. The photographs constituted Nature, shorn of beer can rings, car tires and obnoxious children, as the pristine alternative to industrial pollution, itself rendered visible and actionable in drawings as fumes and molecules combining to attack stylized fish. What an ordinary Swede might have experienced as more difficulty in breathing in old age, or an unusual clarity of lake water in summer, was concretized and connected to large scale social practices. The photograph made it possible for written text to invoke and yet remain silent about utopia; the drawings represented pollution as discrete, localizable, accessible to common sense. The effectiveness of the document as a whole was related to its internal textual economy. Law and Whittaker were also concerned to carry the point that representations are inherently political, in that they allow some things to stand in, speak for, and thus silence, other things. Standing in for Nature, the photograph silenced the natural environment as actually experienced by readers of the text, while mobilizing a stylized version of it for political purposes.<sup>23</sup>

The massive quantities of information circulating through the Canadian educational bureaucracies were distilled and presented annually to provincial legislatures in the form of official reports. These reports used no graphs, drawings, or photographs. Rather, lists, tables, charts, and texts were joined together to publicize and celebrate the incessant advance of public schooling, to defend it from its critics, and to identify the work yet to be done. A silent educational utopia was continually present and textual practices invoked it in the course of argument.

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23. John Law and John Whittaker, "On the Art of Representation: Notes on the Politics of Visualisation," in *Picturing Power: Visual Depiction and Social Relations*, eds. Gordon Fyfe and John Law, *Sociological Review Monograph* 35 (London: Routledge, 1988), 160-183. I offer this simply as an example of a rich and variegated literature.

Consider the typical Ontario Education Department's Annual Report for 1872. Thirty years into the system's operation—25 of them under the direction of Egerton Ryerson as Chief Superintendent—the Ontario reports had acquired a standard format. The 1872 report was unusual only in that it was the first after a major reorganization of public education. The revamped system included new high schools, a re-organized and professionalized inspectorate, a new curriculum and a compulsory attendance requirement. The Chief Superintendent was more than usually occupied in both explaining and defending policy, the more so since the creation of a secondary school curriculum unleashed a new round of attacks from booksellers over the operations of the monopolistic government Education Depository, yet he addressed these issues in a well-worn manner.

The 1872 Ontario report was over 200 folio pages long and was divided into four parts: a Table of Contents, a General Report, a Statistical Report, and a set of Appendices. The four parts presented information and argument about the same subjects sequentially and so the organization of the text suggests a preferred reading strategy. One would find a subject in the Table of Contents, read a brief textual account of it in the General Report, find a set of statistical tables about it in the Statistical Report, and then read supplementary discursive accounts of it in one or more of the Appendices.

The 1872 Annual Report's Table of Contents—a chart—was the only section in which statistics in tables and text were not reported. But the Table of Contents was largely synoptic, stating the conclusions reached in other sections of the report before they were made. Thus the headings of the sections listed under "Compulsory Attendance, the Complement of Free Schools" included such entries as "The sad lessons which ignorance has taught, should not be lost sight of" and the by-then stereotypical "As Education advances, crime diminishes." Or again, the Table of Contents divided the section dealing with the Chief Superintendent's remarks on the new curriculum into sub-sections with headings such as "Pressure on us to advance. We cannot remain stationary," and "Painful results of our present limited course of instruction." If one then turned to the relevant section of the General Report, one discovered that the argument had already been made, and numbers were sometimes invoked as a warrant. Just as William Playfair's early bar graphs had done, this method of presentation abbreviated and simplified information, but also specified a horizon of interpretation as it guided the reader through the report.

The second part, the General Report, began with a short introduction and then offered a commentary on each of the 16 statistical tables contained in the Statistical Report. This organization of the report

encouraged a disciplined reading of the tables themselves, arming the reader with a fore-knowledge of the most important information before encountering the tables themselves. The numbers worked as proofs. The Appendices included the annual report of the provincial high school inspector and extracts from the reports of the elementary school inspectors, supplemented by documents about the Normal School and about teachers. There were lists of teachers certified in the last annual examinations and of teachers on the pension scheme. The material in the inspectors' reports was overwhelmingly textual, but it repeated the arguments made in the General Report in a number of different combinations.

We know nothing about the way in which the Annual Report was in fact read or not read by any section of its audience. Many different possible forms of engagement with it and uses for it seem evident, and the practical consequences of reporting as such cannot be adequately investigated simply by looking at texts. Readers, for instance, might simply have used the Table of Contents to find a statistical table or list and might then have read the table or list simply to locate their county or some named individual. The report may also have been consequential even if it were not read at all, its bulk and lengthy columns occupying a particular field of intelligence and signaling that the government was doing its job.

Yet the absence of techniques of visual representation other than the chart and table, and perhaps the limited interest in or capacity for statistical analysis present in the Education Office itself, meant that the numbers presented in the body of the Statistical Report were surrounded and held captive by interpretive text. Such interpretive material did the work required to connect these selected numerical accounts of educational conditions to other conditions, processes, and projects in the world beyond the educational domain. While Ryerson's educational reports commonly, indeed ritually, cited longitudinal data to chart the progressive advance of the system, or to highlight shameful instances of backsliding, they usually invoked little or no comparative data about relevant conditions. The arguments made in the textual discussion of the tables typically stood in for the establishment of statistical correlations. This is a matter of interest for charting the development and disposition of statistical discourse, as well as for the operation of numbers as a language of power. It also indicates that capacities for the generation of statistical information outstripped those of analysis.

Consider briefly one of the shortest and simplest of the tables from the 1872 Statistical Report, Table D, headed "Public School Teachers" in the Statistical Report (figure 3) and reworked as "Religious Denominations, Certificates, Annual Salaries of Teachers" in the General Report. The columns and rows in Table D were headed "Total." The first three



The highest salaries paid were given, with no information about sex of the recipient. The lowest salaries were given for men but not for women; and the average salaries for both men and women.<sup>25</sup> One could see that the numerical values given for women were lower on average than for men, and that some male teachers were paid well below the female average. The author offered the following comment:

...there is no doubt that amongst the worst enemies to the efficiency and progress of Public School education, are those trustees and parents whose aim is to get what they mis-call a “cheap teacher,” and who seek to haggle down the teacher’s remuneration to as near starvation point as possible, though, in reality, they are intellectually starving their own children and wasting their time by employing an inferior teacher. Businessmen find it to their interest to employ good clerks, as one good clerk is worth two poor ones; and in order to obtain and retain good clerks they pay them good salaries. Experience has long shown the soundness of this business rule and practice in the employment of teachers; yet many trustees and parents, in school matters, abandon a rule on which not only the merchant, but the sensible farmer acts in employing labourers, preferring to give higher wages for good labourers than to give lower wages to poor ones. Good teachers cannot be got for inferior salaries.<sup>26</sup>

The numbers given in the table sat in a complex and murky relationship to the claims made about them in this passage of text. The numbers by themselves offered no support for what was being stated: Ryerson offered no evidence to link the performance of teachers to the level of their remuneration and provided no information about average salaries of people in occupations other than teaching—at \$12 a month, if he had board and lodging, the “cheapest” male teacher in a village in 1872 might well have been comparatively prosperous. Omitting the lowest salaries paid to female teachers disguised their often miserable economic circumstances. The column “Numbers of Schools changing Teachers during the year” might seem out of place according to one logic of classification: it seemed to focus on schools rather than teachers. Here again the treatment of the numbers was similar. The table gave numerical values; the text commented:

I cannot but regret this tendency on the part of trustees to change their teachers. Such a change cannot, as a general rule, be beneficial to the pupils. It has the

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25. The numbers given showed that rural women teachers made about 2/3 of what their male counterparts did; in cities they made 39% of men’s salaries on average; in towns, 42%; and in villages, 48%. The table did not give percentages, simply numbers, and did not indicate the unit of measurement, although one supposes readers would know it was dollars.

26. Province of Ontario, *Sessional Papers: Annual Report of the Normal, Model and Public Schools of Ontario for 1874*, No. 3, (1874), 6.

effect of rendering the instruction desultory, and without any continuity, and weakens the tie that should exist between pupil and teacher.<sup>27</sup>

In both instances, the Education Office commanded sufficient information about schools to have offered a measured defense of its claims. For instance, students were classified by age, sex, and progress through the curriculum (age-grading was not rigidly enforced) for each school district. Ryerson could thus have related salary levels and teacher transience to student performance.<sup>28</sup> Nonetheless, textual description did the work that available numerical correlation and sociological analysis might have done. This is a general feature of nineteenth century statistical development, certainly in the Canadian case, and likely beyond it as well. The technical capacity to observe outstripped, rather than followed, the analytic demands placed on observational resources. Of course, further investigation might have negated Ryerson's claims about the relation between teachers' pay and their efficiency, but he did not invoke the kind of metric required to use observational resources to address dispassionately a policy question he faced. Nor was he unusual in the Canadian state system in this regard.

In terms of the textual economy of numbers, two things are going on in the case of this table and its accompanying text. First, numbers about salary and transience speak to a unifying project and system of classification not explicitly announced in the text, a silent utopia: teaching should be a full-time professional man's occupation and men should be paid sufficiently well as to be able to support a family in respectable circumstances. Like many of his contemporaries, Ryerson regarded the feminization of teaching work with disapproval and disquiet, and the recently-passed 1871 School Act certified his defeat around earlier attempts to keep girls out of institutions of higher education.<sup>29</sup> He undoubtedly knew that the highest salaries went to men and his reporting of lowest male salaries (but not lowest female salaries) enabled his readers to see the, for him, shocking state of affairs in which some men made much less than the run-of-the-mill female teachers. That female teachers were paid so little that they were forced into a variety of relations of social dependence even while employed was not an issue for Ryerson: women were meant to be dependent. It was the threat to men's

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27. *Ibid.*, 5.

28. On the other hand, the concern with transience among teachers is an early preoccupation with flow in the observed population, even if it was not pursued systematically.

29. Alison Prentice, "The Feminization of Teaching in British North America, 1845-1875," *Histoire sociale/Social History* 8 (May 1975): 5-20; Gidney and Millar, *Inventing Secondary Education*, 168 ff.

professional independence that was the problem, and transience was both a symptom of and a cause for this state of affairs. There was certainly no dispassionate spirit of enquiry at work here that would have encouraged the making of correlations in the hope of some unexpected discovery. For the practical purposes at hand, there was no need to delve further into the numbers. Second, and related, the numbers are used in ways that Mary Poovey has called “gestural,”<sup>30</sup> and that one might also think of as decorative or monumental. The numbers signify in part because of their simple quality as numbers. Of course, the annual ritual invocation of ever larger numbers as proof of progress and as pointers to continuing problems was the most characteristic use of educational statistics by administrators. For this, the tabular form of representation was quite adequate—although pictorial graphs might well have had more impact.

### Social Calculus

Alain Desrosières’s important “pre-history” of representative sampling has located the replacement of purposive by random sampling in the later first half of the twentieth century. Desrosières argues that innovation in statistical technique is related to institutional change—specifically, the emergence of national markets for mass-produced commodities and the development of welfare state policy aimed at the intensive administration of national populations. Cognitive changes are inseparably bound up with such institutional changes in his general account of statistical development.<sup>31</sup> Before 1887, the published reports of the two central Canadian education offices contained no inferential statistics. The schooling project defined a homogeneous population and created the elements out of which inferences could be drawn from samples, but no samples seem to have been selected nor inferences drawn from them. If one accepts Desrosières’s argument, then cognitive-institutional barriers to inferential statistical practice must be considered.

I will skirt the larger issues raised both by Desrosières’s argument and by the absence of innovation in visual representational technique more generally in the Education Office’s later statistical work. Perhaps what contemporaries liked to call the “mental outfit” of the education bureau-

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30. Mary Poovey, *A History of the Modern Fact: Problems of Knowledge in the Sciences of Wealth and Society* (Chicago: University of Chicago Press, 1998), 171-185.

31. Alain Desrosières, *The Politics of Large Numbers* (Cambridge, Massachusetts: Harvard University Press, 1998); Alain Desrosières, “The Part in Relation to the Whole? How to Generalize: A Prehistory of Representative Sampling,” in *The Social Survey in Historical Perspective, 1880-1940*, eds. M. Bulmer *et al.* (Cambridge: Cambridge University Press, 1991), 217-244.

crats was the administrative counterpart to the technology of the mature British steel industry—locked into a mode of production once innovative, now outmoded, and too firmly anchored to be displaced. Perhaps fancy printing and graphs were excluded for budgetary reasons: further research might address such matters. On the other hand, within the confines of its relatively narrow representational repertoire, there is evidence of developing variety and sophistication in the statistical analysis published by the Ontario Education Department over the period under investigation. By 1882, for instance, the minister was publishing total average costs per pupil educated by municipal division and also average costs per pupil for expenditure on teacher's salaries and for expenditure on school buildings. Comparative figures on educational costs were invoked for different jurisdictions. Statements of average conditions in relation to other aspects of the schooling project were also now commonly given—the average attendance in all schools throughout the year as a percentage of the total number of school age children, for instance, disaggregated into numbers of students attending for different lengths of time.

The Minister of Education continued to invoke statistical material to defend public education, although by the late 1880s it was no longer necessary to invoke general arguments about the value of education. As the reality of schooling became a normal part of social life, it was the details of its management that called for public defense. For instance, in his 1887 report, the minister provided a detailed table of attendance patterns in the province over the preceding decade and then repeated its contents in prose. He explained that he had two purposes in doing so: "(1) to point out as strongly as possible a grievous fault for which only parents and guardian can provide a remedy; and (2) to show that there is very little to fear from so-called *over pressure* in the public schools." The minister could take it as self-evident that low attendance was "a fault," but given both recent curriculum changes and strengthened enforcement of the compulsory attendance regulations, he was constrained to counter the claim that the schools were damaging students' minds by forcing them to do too much mental labour. Again, this seems like a quaint debate, but we should recall that eugenicists were claiming that people could either spend their energies in procreation or cogitation, not both, and that the birth rate of the dominant classes was declining because men were engaging in white collar occupations where their vital energies were

sapped by brain work.<sup>32</sup> The schools were forcing the decline of the best classes of the white race, in this perspective.

The minister's argument was that if any students were in danger of overwork, it would be that small number—14,918 out of 487,496—who attended for more than 200 days a year. He asked:

Now what is the extent of this danger? A pupil who attends school say 200 days in the year applies his mind for only 1,200 hours, allowing 6 hours per day (or if another hour is allowed for home work, 1,400 hours) in the year, or a trifle over one-seventh of the time. This is the maximum mental strain on any part of our school population—a strain, if I might call it such, which could only affect the most delicate constitutions.

And he concluded:

I fear there are greater evils in our schools than over pressure. Bad ventilation, defective sewerage, and a disregard of the ordinary laws of health [a code phrase for smoking, drinking and masturbation] have much more to do with the physical condition of pupils than any pressure imposed by heavy tasks or school programmes.<sup>33</sup>

The argument is quite simplistic—are children being overworked at school? How much work are they doing? Not much, so they must not be overworked—and obviously vulnerable to a counter-claim that would attempt to specify a threshold of dangerous mental work in terms of intensity rather than duration. Still, even while dependent on a commonsense notion of “overwork,” the minister could disaggregate the population of those attending school and provide a calculation of how much work on average the most assiduous among them were likely to perform. The nature of the questions posed to public educational administration had changed, but a calculus could be invoked to address them.

Finally, the increasingly intensive and extensive observational coverage of the educational domain itself allowed administrators to chart the regularities of the domain in ways of which they had not earlier been capable. Such coverage caused new objects of knowledge and problems of administration to emerge and provoked new kinds of reflection. The school inspector of Dundas County, Ontario, to take one example, constructed a profile of teachers' careers in 1887—a matter of general concern to the ministry, since, among other things, the provincial normal schools were producing about 400 graduates annually, while the annual

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32. G.J. Barker-Benfield, “The Spermatic Economy: A Nineteenth-Century View of Sexuality,” in *The American Family in Social-Historical Perspective*, ed. Michael Gordon (New York: St. Martin's Press, 1973), 336-372.

33. Province of Ontario, *Sessional Papers*, No. 7, (1888), “Annual Report of the Minister of Education for the Year 1887, With the Statistics of 1886,” xiv-xv.

increase in the number of teachers in the system with normal school certificates was only a quarter that number. The Dundas inspector claimed the most serious problem with the schools in his county was “the shortness of the professional life of the teacher,” and he focused on the condition of those holding the lowest, third class certificates, which were subject to renewal after each three-year term. The problem was that the third class certificate holders rarely stayed in the occupation for more than two terms; indeed, the average stay had been 3 1/4 years and he claimed it was declining, although here he invoked no exact figure.

The cause of this state of affairs was that the examination standard was regularly raised and these teachers found themselves having to spend all their spare time working to meet the raised qualification, without ever having security of employment. Just when they had mastered the conditions of the occupation, those conditions changed, and insecurity drove them out. Matters were worsened by the fact that the second class certificate holders frequently left as well for higher pay elsewhere. This inspector suggested that successfully renewed third class certificate holders be admitted to a normal school after two examinations. The point is that this even minor official could now use the system’s observational resources to construct typical trajectories for categories of population and could use these in explaining problematic patterns in his jurisdiction.<sup>34</sup> Flow and movement in a population were susceptible to measurement, and policy responses could be drawn on the basis of such measurements. Of course, in terms of practices of visual representation, text still dominated. Yet the multiplication of observational resources and the grappling with practical problems combined to generate novel conceptual representations.

## Conclusion

Graphic and other forms of visual statistical representation in the 19<sup>th</sup> century Canadian state system lagged behind practice in other countries. The lag was due neither to a lack of statistical material nor, likely, to ignorance of international practices. Canadians attended the International Statistical Congresses and agencies such as the Board of Registration and Statistics had access to American material in which a rich variety of visual techniques were employed to present census data. Yet the 1887 bar graphs of the official statistician, George Johnson, seem decidedly parochial when placed beside the pie charts, circle graphs, double

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34. Province of Ontario, *Sessional Papers*, No. 7, (1888), “Annual Report of the Normal, Model and Public Schools of Ontario for 1888,” 116-7.

pyramids, and thematic maps of his American counterpart. Johnson's pictorial graphs stand the comparison better, their aesthetic qualities combining with the skewing of results inherent to this mode of representation to carry a strong message.

The large administrative departments of the Canadian state system can be seen as the laboratories of social and administrative science. They laid hold of social relations and practices, purified and simplified them, invested them in textual forms, classified and categorized the data that resulted and used them to some extent in practical projects of mastery in the administrative world. It is striking, however, to what extent the observational capacities and resources of the administrative sciences outstripped their analytic interests and practices. Until the last years of the nineteenth century especially, when mass market production and retailing began to shift the locus of statistical production towards private enterprise, and when the identification of new social problems such as unemployment and urban mortality, and the organization of new administrative agencies such as labour bureaus and departments of public health, led to more systematic enquiry, the masses of statistical information generated by government bureaus were little used. When they were deployed in official discussion and debate, they addressed often minor technical problems or they served as ideological instruments.

Regular reporting did make it possible for administrative agencies to monitor the effects of policy in localities and potentially to identify problems or sources of innovation. Auditing of accounts could prevent fraud. Yet the relatively minor implication of statistical resources in speculative analysis suggests that their ritual and ideological dimensions were most significant. Numbers commanded increasing prestige in the 19<sup>th</sup> century and in the education reports examined above, their presence was used to bolster arguments to which, often, they did not indeed speak. On the other hand, the ritual and ideological share common ground with the aesthetic: it remains peculiar that Canadian officials did not seek to pair the beauties of visual statistical representation with their claims. *Johnson's Graphic Statistics* was a move in this direction.