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SCIENCE AND SCIENTISTS IN GOVERNMENT, 1878-1896 -- PART I*

Vittorio M.G. de Vecchi (1941-1983)

1

There seems to have existed a notion -- one may almost say a corporate myth -- that the Royal Society of Canada did since its foundation serve as a kind of advisory board to the Government on scientific matters.¹ The leaders of the first group of Fellows nourished the hope of performing just such a function. Admittedly, it was natural to hope that a national learned society whose scientific sections were largely composed of government employees would develop into an effective 'transmission belt' between science and politics. Likewise, the sum of the achievements of Fellows of the Royal Society of Canada in the employment of the state could be perceived as the collective record of achievement of the Society itself. Further analysis, however, shows both the hope and the perception to be fallacious.

The repeated failures of the Johnson committee of the Royal Society to persuade the government to sponsor the study of tides are an example of the almost total lack of influence of the national learned body. In the end a small appropriation was granted after a strong representation on the part of the shipping industry. As for the other programmes proposed by the British Association, either they found a place in existing activities (reduction of magnetic observations, permafrost) or the problem of government sponsorship was by-passed by means of a BA grant (ethnology). In short, on those occasions in which the Royal Society took corporate action the results were very disappointing.

The men of science expressed their understanding of the reasons for the lack of effective communication with government in terms of pure and abstract science vs. applied and utilitarian science -- sowing and reaping, enlightened self-denial and materialism. Correct as this diagnosis might have been, it was in a sense incomplete. For, besides all consideration of the particular type of science and scientists likely to be of benefit to the nation or of use in the realization of favourite policies, politicians usually paid particular attention to those issues that would extend or threaten their political basis. It is perhaps a comment on 19th-century Canada to note that no political career was helped (and much less threatened) by matters connected with the relations between science and government. It is possible, however, to identify the political interests that the governmental scientific activities of the period 1878-1896 more

* The second of three articles drawn from the doctoral dissertation of the late Dr Vittorio de Vecchi, this article is a slightly revised version of Chapter 4. The final, companion article drawn from Chapter 5 will appear in the December 1985 number. Ed.

or less marginally served: shipping and agriculture could benefit from astronomical, magnetic and meteorological studies; the Hudson's Bay explorations were inspired by strategic worries and by the hope of finding an alternative route to the North West; contributing to the expenses of the international circum-polar observations, and of the observation of the transit of Venus on 6 December 1882, Canada did her bit as a part of the British Empire and as an emerging nation; finally, the Geological Survey was meant to be of use to the mining industry and in the settlement of the West. It is open to question -- indeed, it was repeatedly queried in the 'eighties -- whether these scientific activities were actually beneficial to the interests they purportedly served; the themes that emerged in the numerous controversies are discussed below. First, however, agriculture should be considered as the basis of the Canadian economy and the activity which comprised the largest number of voters.

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The 1867 British North America Act gave concurrent powers of legislation respecting agriculture and immigration to the Dominion and to the provinces. At first, the federal Department of Agriculture's main task was the promotion of immigration into Canada. Other, relatively secondary tasks were the administration of the Marine Hospital in Quebec, quarantine, statistics and patents and copyrights. As for agriculture proper, in 1873 the Conservative Minister of Agriculture John H. Pope denied in Parliament that the government had any intention of establishing a Dominion Board of Agriculture. Later in the same session, he declared, upon questioning, that it was not the intention of the Government to establish an agricultural college with a model farm attached.² It was a sensitive issue: as early as May 1868, just after Confederation, the Liberal opposition fought against the very existence of a federal department of agriculture; they even attempted to introduce a last-minute amendment to the organisation bill, formally barring the future department from meddling with agricultural matters, but the amendment was defeated upon division.³

It can be argued that the reasons for the emergence of agriculture as a federal concern in the 1870s must be searched for in the attempts of the Conservatives to woo the farmers' vote away from the Liberals. The latter, traditionally strong in rural Ontario and frequently in power in that province, opposed the Conservative moves out of a desire to preserve their own political basis and to further the practice of de-centralisation. The Conservative attack concentrated on two main issues: that of the agricultural tariff and that of the need for new 'scientific' farming methods.

The first was clearly an extension of the general policy of protection that J.A. Macdonald and his party gradually espoused and eventually reaped electoral benefits from. In the spring of 1874, Dr George T. Orton, the Ontario Conservative MP, began vocally to champion the farming interest and to demand that a Select Committee be appointed to consider what would best further the agricultural industry. He was sure, he said, that the farmers of Canada desired protection.⁴ The same theme and the demand for an agricultural committee were brought up again with

renewed emphasis in the years 1873-78, during which the Conservatives were in the opposition in Ottawa. It was hinted that the Grangers (of whom more below) supported protectionism, and that they would submit within a year a petition in this sense bearing the signatures of 100,000 farmers.⁵ In reality, only 5,000 signatures were collected, much to the puzzlement of the secretary of the Dominion Grange, and the petition was never made public.⁶ The rural vote, however, went largely in favour of the Tories at the 1878 election.

The political appeal of the second issue used by the Conservatives in their bid to attract the rural vote was particularly hard to assess. The application of science, especially chemistry, and scientific techniques to agriculture is usually dated from the publication of Liebig's *Die organische Chemie in ihre Anwerdung auf Agricultur und Physiologie* (Brunswick, 1840). The impact of Liebig's work, whose French and English translations appeared practically simultaneously with the German edition, was particularly great in America, where the fertility of the land in the settlements was steadily waning.⁷ The broad movement towards scientific and technical farming instruction, started in the US by the Morrill Land Grant Act of 1862, found a limited Canadian counterpart in the opening of the Ontario Agricultural College in 1874.⁸ Yet it was by no means clear, either in the United States or in Canada, that the farmers at large were persuaded of the utility of agricultural research; an element of traditionalism, of suspicion towards the new and towards outsiders, was frequently present among those agrarian communities. Thus, when the Conservatives, during the short years of Liberal rule, mixed their arguments in favour of protection for the farmers with suggestions of federal scientific assistance to agriculture, the Liberals countered, repeating Joseph Rymal's statement that the farmers 'merely wanted to be severely let alone.'⁹ It must be noted, in fairness, that the Liberal Minister of Agriculture Luc Letellier repeatedly pointed out, in his yearly reports, the possibility of a future endowment of 'Agronomic Institutes' that would engage in research and in the diffusion of information.¹⁰ The generic terms, however, in which the ideas were expressed made it not much more concrete than the recommendations which, in the same sense, the Conservative ministers J.-C. Taché and John H. Pope had put forward as early as 1871 and 1872.¹¹

One of the elements of the Conservative offensive that riled Liberal MPs, such as the farmers Joseph Rymal and Robert Smith, was that the enemy champions of the agricultural interests in Parliament were Dr Orton (a medical man), the engineer Francis Jones and the shipbuilder Lachlan McCallum. Not only were they political opponents, they were outsiders.¹² The sting of the accusation, and its immediate political relevance, was increased by the fact that, during the 1870s the Grange arrived in Canada from the United States, with its message of farmers; self-help and co-operation.

The Order of the Patrons of Husbandry, also known as the Grange, although born on the Atlantic seaboard of the United States in the years immediately following the Civil War, found its natural environment in the states of the Midwest, as did many subsequent agrarian reform movements. In particular, the Grange gave a voice and a purpose to a widespread resentment against the

railways. Farmers, who at first welcomed the post-war railway boom and frequently invested their savings in those schemes of development, often found themselves cheated of their capital and exploited by the monopolistic practices of the railroad operators. It was only the largest and most immediate aspect of a new economic system, catering to manufacturing and commerce, that seemed not to take into account the needs and potential economic weight of agriculturists.¹³ Outsiders -- railroad promoters, bankers, middlemen -- were then perceived as responsible for the honest farmer's plight. The answer was to organise; the result was a flourishing of state-wide, Grange-sponsored, co-operative ventures into distribution and marketing, the manufacture of farming implements, insurance and banking.¹⁴

In a temporary reversal of the westward spread of the Order, the Grange took root in Vermont in 1872 and, immediately after that, in the Eastern Townships of Quebec. The agent of this remarkable organising feat, the Vermonter Eben Thompson, soon realised that the fertile farming area of western Ontario and the Niagara Peninsula could provide an audience naturally receptive to the ideas fostered by the Grange. The first Ontario chapter of the Order was founded by Thompson in Pond Mills near London, in February 1874. The Master was William Beattie, farmer and sheep-breeder at Pond Mills; John H. Elliot, a farmer of strong Reformist tendencies in politics, was Secretary; and Henry Anderson, another Reformer, was Lecturer.¹⁵

With this move, Eben Thompson placed the Grange at the very heart of that aspect of Ontario, and later federal, agricultural politics that was to play a significant role in the establishment of the Dominion Experimental Farm. The presence of Henry Anderson among the officers of the first Ontario chapter of the Order was symptomatic; his name appeared repeatedly among the organizers and office-holders of major initiatives. Anderson was one of the originators of the Western Fair Association and was its general superintendent between 1868 and 1871; in 1871 he was appointed superintendent of the Agriculture and Arts Association of Ontario, a position he held until 1881; he was also, at various times, an officer of the Horticultural and Mechanical Association of the Town of London, of the Westminster Township Agricultural Association and of the Middlesex County Agricultural Society. Local societies (kept in business by a yearly provincial grant), and on a more important scale the semi-official Agriculture and Arts Association, were key centres of political pressure and patronage. Among the members of such bodies could be found the Liberal senators Elijah Leonard and David Christie, as well as William Saunders, the future director of the Ottawa model farm.

Thus in its move to western Ontario, the Grange, although declaredly non-partisan, acquired supporters in the politically well-connected reformist wing of the ruling Ontario Liberal Party. As the effects of the 1873 slump and of the crippling collapse of wholesale prices in the following five years¹⁶ were increasingly felt by the farming community, the Order and its gospel of reform enjoyed a period of spectacular success between 1874 and 1878. The Dominion Grange, the Canadian 'chartering' body which presided over the proliferation of chapters that took place during those years, was set up in June 1874 in

London, Ontario; Henry Anderson was on the Executive Committee, and the American Quaker immigrant Squire W. Hill of Ridgeville was elected Master.¹⁷ It was in April 1874 that the Conservative George T. Orton, MP for Wellington Centre began clamoring for a Parliamentary select committee on agriculture; it is hard to resist the suspicion that Orton's sudden advocacy of the farmers; interests was partly connected with the events then taking place in his native rural Ontario. Conversely, the reaction of the Liberal George Casey, of Elgin County in western Ontario, seemed to echo the gospel of self-help:

The Committee was not composed of farmers, but represented a sort of gratuitous interference by the gentlemen of the learned profession . . . The farmers had nothing to do with the movement [i.e. the Select Committee], knowing well their own business.¹⁸

In short, Orton was told in no uncertain terms that he was poaching.

The Conservatives' pressures had similar effects in the matter of protection and in the matter of agriculture as a federal concern. In both cases the administration introduced half measures. On the one hand, the Liberals in time implicitly recognized the strength of the case put forward by their opponents, and raised the tariff by an amount inadequate, as it was judged, to afford protection. On the other, in 1877 agriculture was allowed to surface at the federal level by means of a measure that would not really bring it within the scope of federal jurisdiction.

The Dominion Council of Agriculture, the body often taken to mark the beginning of the agricultural branch of the federal Department of Agriculture, was set up in April 1877 in order to advise the Minister on all matters pertaining to the farming interest. One of the twelve committees into which the Council was divided was on scientific agriculture. Eight of the thirteen councillors were drawn from the members of both Houses, and carefully balanced to represent all provinces as well as the North-West; only three members were Conservatives. The rest of the councillors were representatives of the two main agricultural associations of Ontario and Quebec. Most of the politicians were also members or officers of provincial agricultural bodies. In other words, both the function and the membership of the Council were chosen in such a way as not to threaten the existing pattern of decentralisation of agricultural affairs.¹⁹

The weight acquired by the Grange can be inferred from the composition of the Ontario delegation on the Council. All four members, naturally enough, were also members of the Agriculture and Arts Association of their province. Three of them were clearly Grange sympathisers. The first, Ira Morgan, delivered an urgent and official appeal in favour of the Order in his capacity as president of the Ontario Agriculture and Arts Association for 1876.²⁰ The second, Stephen White, was one of the charter members of the Dominion Grange mentioned in the Act of Incorporation of 1877. In addition, the Rev Robert Burnet, the well-known horticulturist from Hamilton, was known to have

emphasised his recommendation to get rid of middlemen in fruit marketing with the cry: 'Organize, organize, organize.'²¹ Finally, the President of the Dominion Council of Agriculture, Senator David Christie, an Ontario Clear Grit, was a close acquaintance of Stephen White's.

Furthermore, a few days before the appointment of the Council, the Bill of Incorporation of the Dominion Grange received a third reading and was passed, after having been carefully shepherded through both Houses, respectively by Joseph Rymal, the Hamilton-area Liberal MP, and by the Liberal Senator and London manufacturer Elijah Leonard.²² Once again, it would appear that the Liberal strategy was one of prudent nurture and control of the political forces that found their expression in the Grange movement, in the attempt to forestall the Conservatives' conquest of the rural vote. Indeed, even some clearly Grange-inspired legislation reached Parliament in March 1878; William A. Thompson, Liberal MP for Welland argued at length in favour of the establishment of County agricultural banks owned and run by farmers, which would lend money at a low interest rate and improve the money supply.²³

The scheme never saw the light of day. In fact, the year 1878 marked the failure of the Liberal strategy, a reversal of the rural vote and the ultimate defeat of the Mackenzie Government. The Dominion Council of Agriculture, during its short existence, was hampered in the fulfillment of its brief by the lack even of travelling funds for its members. W.A. Thompson, the advocate of agricultural banks, died. The Grange itself entered a phase of decline as rapid as the expansion had been exuberant. By the end of 1879, the only solid things were the Tory majority and the protectionist tariff.

Despite the final series of collapses, this first round of attempts to bring agriculture within the purview of the federal government helped to clarify a few points. First of all, the issue of agricultural research could not stand alone. Everyone could see (indeed, the Tories based their campaign on it) that the farmers were squeezed between impoverished land and plummeting wholesale prices, but remedies for the latter could provide infinitely more political advantages than remedies for the former. In the Conservatives' arguments, agricultural research rode the coattails of the tariff. In the eyes of the Liberals and of their temporary allies, the Tories' talk of federal technical assistance to farmers appeared as a pretext for other Conservative measures -- a Trojan horse carrying protection and centralisation.

When, at the beginning of the 1880s, the second round of debates began, J.A. Macdonald was firmly in the saddle in Ottawa, and the Grange had lost its political weight. Nevertheless the terms of the problem, and those of the debates, did not change. In the face of a politically inevitable form of centralisation -- a Dominion Experimental Farm -- the critical point of the farmers' dislike of outside interference found its expression in the arguments over the *type* of work a federal model farm should do. In the resolution of this problem emerged the figure of William Saunders, respected for his scientific achievements and a product of the above-mentioned rural Ontario network.

The 1882 Select Committee 'on the Operation of the Tariff upon the Agricultural Interests of the Dominion' was another brain-child of Orton's. Nothing could appear more harmless than the desire of taking stock after three full years of operation of the National Policy. The proposal, in fact, also received the support of Timothy Anglin, the New Brunswick Liberal MP; both sides of the House could hope to get the opportunity to show how their prophecies had been fulfilled.²⁴ The scheme, however, soon became tainted; when an anticipated general election was called for 20 June 1882, the availability of a parliamentary report in French and English, ordered to be printed five days before the dissolution of Parliament, appeared too convenient to be just a coincidence. Especially when the slim report, after an impressive array of tabulated data, summed up:

Since the Tariff came into operation our people have not only supplied the additional home market of \$12,029,131, given by the exclusion of American farm produce, but have also exported very largely, which would lead to the conclusion that the protective Tariff had stimulated and encouraged the production of farm products.²⁵

The evidence was purportedly gathered by circulating a questionnaire to municipalities, agricultural societies and 'representative' farmers or, as James Trow, the Liberal MP from Stratford alleged, 'the Conservative members of the House circulated the questions only among their friends.'²⁶ His party colleague John Charlton denounced the report claiming that it was 'purely an electioneering document and was issued for electioneering purposes.'²⁷ This accusation would be well substantiated if indeed the entire supply of reports destined for Wellington County was sent to Dr Orton -- as James McMullen, the Wellington North Liberal MP, bitterly complained.²⁸

Orton's insistent advocacy of agricultural interests responded to two principal needs. On a personal level, as the holder of a marginal rural seat, Orton had everything to gain from appearing to be the sponsor of initiatives that brought the agricultural interest to the attention of Parliament. In a more general way, the Conservative party, traditionally weak in rural areas, was keen on disproving the Liberals' contention that the Tariff benefited manufacturers at the expense of the farmers. It was from such considerations, internal to the logic of politics, that the Experimental Farms System was born and not, as the other scientific departments of government, from the efforts of the scientific community at large. In the election of 1882, Orton's constituency became something of a test case when the Liberals put up the former Minister of Finance, Sir Richard Cartwright, as their candidate. Despite the advantageous re-drawing of the boundaries of Wellington Centre achieved by Macdonald's gerrymandering, Orton did not undervalue the threat posed by Cartwright and pressed upon Macdonald frantic demands of last-minute patronage claiming: 'If Cartwright beats me they will say the farmers are against the N[ational] P[olicy].'²⁹

The effectiveness of Orton's efforts to capture the farming vote was demonstrated when he won the seat by a majority more than five times larger than that he could hope to achieve through the gerrymander. It was clear that there was political capital to be made from measures manifestly aimed at promoting agriculture, especially since the provinces were not very active. Despite the concurrent powers of legislature granted by the BNA Act both to provincial and to federal governments, only a few provincial initiatives saw the light during the first fifteen years after Confederation. Admittedly, local agricultural societies existed throughout the Dominion, and in most provinces a council or a provincial association coordinated and supervised their activities. In Ontario and Quebec a cluster of other institutions, such as agricultural colleges and provincial exhibitions, received provincial grants and thus warranted the existence of a government commissioner. Manitoba's institutions comprised a council, a board and a minister of agriculture, but they were all established in 1882 and for the next few years remained in a rudimentary state. In New Brunswick a government stock farm, started in 1881, was the only sign of activity. Finally, the minister of agriculture of British Columbia also had three other portfolios which took up all of his time and energies. Federal schemes, in short, stood little chance of duplicating, or conflicting with, existing initiatives.

Accordingly, parliamentary attention to agriculture increased after the 1882 election. Just as the nature and findings of Orton's 1882 committee were being criticized, a new select committee, including Orton but not chaired by him, was completing its work with the reception of the last *viva voce* testimony. The Conservative George-Auguste Gigault, the chairman of the select committee 'on the Best Means of Encouraging and Developing the Agricultural Industries of Canada,' made clear the political aim he was pursuing. 'There are bounties for the fisherman,' he told Macdonald, 'for the manufacturers of iron, for the constructors of ships, and there is no special legislation for the benefit of the agricultural class.'³⁰ But Gigault's committee showed a more sophisticated nature than that of previous similar parliamentary initiatives. It was not any longer -- a wary Edward Blake was assured -- a matter of curing the ills of agriculture by means of a financial measure, such as the Tariff, or of verifying its effectiveness. This time, 'it will be the business of the Committee to enquire into the possibility, on the part of the Department of Agriculture in Ottawa, to adopt the system [or] part of the system followed in Washington.'³¹

Despite reassurances, a deeper internal logic, adumbrated in the debate of the 1870s, connected the diverse strands of the Conservatives' measures regarding agriculture. The existence of the United States, and especially their competition, provided a focus: George E. Foster, the future Sir George and member of Tory cabinets from 1885 to 1921, argued that the expansion of the aggressive American trade was spurred in 1867 by the Canadian union. The creation of the US Bureau of Agriculture which distributed scientific information, he suggested, was one aspect of that government's assistance of the new expansion. Canada could resist and compete; she could resist by means of the Tariff, and compete by matching the US

support of agriculture by means of an equivalent institution.³²

It is debatable whether, and to what extent, Confederation stimulated new ideas and activities in the US in general, and in Washington in particular. The import of Foster's statements should be understood in the context of the attempt to establish, not just the legitimacy, but the necessity and acceptability of formal federal intervention in agriculture. Two purposes were served by the choice of the American bureau as a model: on the one hand, it provided a useful precedent for the Tory tendency to centralise, on the other the reference to an American institution helped make the idea palatable to those liberal forces that preferred the US to Britain as a source of inspiration. The acceptance of the American model by J.-X. Perrault, the Liberal and anti-Confederationist from Quebec, former secretary of the 1877 Dominion Council of Agriculture, is a clear illustration of the latter point. As for centralisation, the Tory political philosophy was explicit; the agricultural interest should not be left to take care of itself -- that was old-fashioned government:

All the really great interests of the country [once] were allowed to take care of themselves. Now-a-days, Governments take it as a rule of their conduct that all these interests should be gradually drawn within their purview, and should be assisted by all the talent and skill they demand for their fullest development.³³

In short, 'talent and skill' were conceived as the instrument of government intervention; the Liberals' fears of the 'seventies, that science would be a pretext for centralisation, seemed to be realized. Furthermore, aside from the specific Canadian political rivalries, the issue of the centralisation of scientific research was not particularly controversial.

The principle received a blow of sorts in the US with the passage of the Morrill Act, which seemed to give the states a kind of sovereignty over scientific enterprise in agriculture. By the early 1880s, however, the poor performance of the 'Morrill' colleges gave rise to a few centralising attempts in the United States. Canadians were aware of these developments, as can be gathered from the comments of Thomas Bain, the Hamilton MP -- one of the few Liberal members of the 1884 Gigault committee -- and from the reports of the agricultural press.³⁴

Finally, the Government's case was all the more acceptable, if not persuasive, for being supported by a majority of about seventy seats in Parliament. Typically enough, the Select Committee set out with an avowed specific model in mind -- the Washington bureau's activities as a clearing house of information, and the attached experimental farm -- and concluded after two months' work 'That the Government take into earnest and favourable consideration the advisability of establishing a Bureau of Agriculture, and an Experimental Farm in connection therewith.'³⁵

The information gathered through the distribution of a questionnaire 'to addresses furnished on application by members of the House of Commons,' and from nine days of hearings during which nineteen witnesses were interrogated, mainly provided a number of qualifications to the Tory plan. The real opposition came from those quarters of the farming community that distrusted anything connected with party politics. Apart from a general suspicion towards science as a form of book-learning voiced by one member of the Grange delegation, but by no means limited to members of the Grange, it was science insofar as it was compromised with politics that was disliked:

If our farmers want to convert Ottawa, like Washington, into a dumping ground for all the rubbish of partisans and broken-down speculators, by all means let them favour the establishment of the proposed bureau.³⁶

William Weld, the author of the above passage, was the editor of the London *Farmers' Advocate*,³⁷ and a successful and enlightened farmer. As a promoter of intelligent and systematic farming, he could not be suspected of opposing the federal project of experimental farming out of blind faith in rule-of-thumb methods. Weld's reservations stemmed, rather, from the belief he put forward in his influential paper that politics would make nonsense of the cause of scientific farming. In short, the rejection of party politics was compatible with the belief in the neutrality of scientific expertise. The implicit message was that the federal scheme could be acceptable if the men whose science was requested by the government would be known not to be sensitive to partisan pressures. Both the dislike of party politics Weld publicised and the distrust of bookish learning were traditional characteristics of the Canadian farming community. In a sense, the political characteristics of the sector of the economy -- in this case farming -- in which the government was proposing to intervene posed limitations as to the particular type of science and the particular type of scientist that could be effectively used. The contrast between agriculture and geology will make this point clearer.

4

The meanings of the word science, as used in the arguments over governmental scientific institutions, covered a wide spectrum. In the first place, a systematic and accurate way of performing a task was often referred to as scientific. This was the meaning used, for instance, in the title *Scientific Butter Making*, a summary of techniques prepared by W.H. Lynch, of Danville, Quebec, and purchased, printed and distributed in thousands of copies by the federal government. Economic implications followed naturally: the intelligent, educated systematic approach to farming could make a difference between success and bankruptcy. In anachronistic terms, 'scientific' farming could increase productivity and save the increasing number of marginal operations:

The conditions of farming are altogether changed from what they were even a few years ago, when the

country was settled; it was labor then -- now it is intelligence, and the consequent proper use of capital in farming.³⁸

There further followed a conclusion which concerned policy. If scientific farming was useful in marginal conditions, it could be dispensed with in non-marginal ones; indeed, it should be avoided, the *Farmers' Advocate* argued, if it involved government interference. The North-West was a case in point:

Agricultural colleges in themselves, if properly managed, and where necessity demands are beneficial. But what would be the use of going to the expenditure of thousands of dollars to build an institution in a country where any man who can farm a furrow can raise a crop from the virgin fertility of the soil?³⁹

It should be noted that the point of view described so far embodied a peculiar set of values. Science, understood as the rationalization of practice, was acceptable only insofar as it minimized losses, not insofar as it could maximize returns. In this restricted role, science was seen as having a practical and economic function which was in harmony with the notions of 'making an honest living' and a 'fair profit,' so extensively fostered by the Grange in the 'seventies.'

Such an attention to the economic effects (and one particular economic effect, for that matter) of the introduction of science into farming, could not be more different from the understanding of science embodied by the Royal Society of Canada. Daniel Wilson's condemnation of the 'misapplied thrift' involved in refusing support to abstract science, and similar pronouncements of other fellows, were in marked contrast with the parsimoniousness implicit in the objection to spending money even on practical research, unless dictated by necessity.

Between the two extremes was the range of options actually considered by government. Here, too, a particular understanding of the word 'science' went together with the political choice of drawing within the government's purview all the major interests of the country. The central concept was that of information, and it affected not only the measures concerning the Department of Agriculture, but also the government's activities in the fields of public health, geology and meteorology.

The usefulness of statistical information as an instrument of government became a central issue in Canada during the 1880s. The systematic collection of data coincided, up to a point, with the natural need of a largely unexplored country to find out about its physical geography, climatic characteristics and strategic potential. Among government initiatives that made use of scientists, as distinct from professional men such as surveyors, the Geological Survey and, after 1890, tidal research served in part the first purpose; the Meteorological Service essentially served the second; finally, the *Neptune* and *Alert* expeditions to Hudson Bay in 1884, 1885 and 1886 were originated by a desire to explore a possible alternative route to the West that would be safe in case of trouble with the United States.⁴⁰

The last enterprise also employed personnel of the Geological Survey (Robert Bell), and of the Meteorological Service (A.E. Gordon, R.F. Stupart and F.F. Payne).

But the federal government slowly extended its data-gathering activities beyond the need of knowing the essentials of the Dominion. In this, Canada was following in the steps of many other countries; the expansion of government into diverse areas of civil life -- a widespread nineteenth-century phenomenon -- was accompanied by a multiplication of special statistics. The parallel extension of the meaning of the word 'statist' to include statisticians as well as statesmen reflected a change in the understanding of the function of government. At the same time, the works of *savants* like the Belgian Adolphe Quetelet (sometime tutor of the Prince Consort) and of civil servants like William Farr of the British Registrar-General's Office, developed the analytical tools of the discipline. Thus statistics, which was associated with a notion of rational government since its eighteenth-century origins, became one of the new sciences of the nineteenth, and the ostensibly successful extension of the scientific method to human affairs. In this sense, the collection of quantified information by governments was by and large understood as an aspect of modernisation.

It should be noted, however, that the traditional purposes of statistics were the collection of revenue and centralised political control. Seen in this light, the gathering of data was intimately connected with the need of monitoring state income and expenditure; the first set of educational statistics, for instance, that appeared in Great Britain was a consequence of the granting of public funds to education in the 'thirties.'⁴¹ Despite the aura of objectivity and neutrality lent to the discipline on the occasion of the establishment of the Manchester Statistical Society in 1883, and of the formation of the Statistical Section of the British Association the same year, the connection with matters of policy was direct.

The constitutional structure of Canada gave a further political content to any discussion on statistics. All departments of government, federal and provincial, naturally collected those statistics that would enable them competently to administer specific acts passed by Parliament or by local legislatures. But the general power to deal with statistics was restricted to the federal authorities by the BNA Act. The Department of Agriculture was chosen to deal with everything pertaining to the decennial census and other statistics. This state of affairs was doomed to breed all manner of dissent between Grits and Tories, de-centralisers and centralisers. When the Liberals in 1878 proposed an appropriation of \$5,000 for the preparation of criminal statistics (criminal law was also the exclusive domain of the federal government), Charles Tupper seized the opportunity to press upon the Government the need for an expansion and generalisation of statistical work, and in particular the compilation of vital statistics.⁴² The Prime Minister, Alexander Mackenzie, not only declared that the cost would be too high, but contested the exclusiveness of the federal administration's authority.

At the opening of the 1879 session of Parliament, the first since the return to power of the Tories, the Governor-General announced his Government's intention 'to consider the propriety of providing some means for the collection and collation of vital, criminal, and general statistics.'⁴³ Despite the constitutional objections raised in Parliament by Alexander Mackenzie and David Mills, the Act became the cornerstone of successive federal data-gathering activities.⁴⁴

During the days in which the Census and Statistics Bill were introduced and discussed in the Canadian Senate, the US National Board of Health was established. One of the first acts of the new institution was to ask the Canadian Meteorological Service to forward their reports to them, with a view to contribute to the study of the influence of the weather on health. A committee of the Canadian Medical Association, with the support of the Meteorological Service, approached Sir Charles Tupper in order to obtain support for a scheme of vital statistics which would include a line of research of the type suggested by the US Board of Health. Tupper, by then a member of the cabinet, not only was known to have gone on record in favour of centralised vital statistics, but was also the former first president of the Canadian Medical Association.⁴⁵ The proposal was favourably received by the Minister of Agriculture, J.H. Pope, but its implementation was postponed until after the 1881 census.⁴⁶ A limited, 'cheap' scheme was in fact introduced in 1882; the plan was to gather and coordinate the data already collected in the eleven cities of the Dominion that had a Board of Health. The system, supported by a yearly grant oscillating between ten- and twenty-thousand dollars, survived amidst accusations of political favouritism and uselessness until 1891, when it was cancelled altogether.⁴⁷ What was notable, however, was the fact that the Dominion government granted an admittedly small amount of money to a statistical study in a field in which it had no administrative stake. In this sense, the very approval of the scheme confirmed the political choice expressed by Tupper in 1878; conversely, the lack of a specific administrative purpose, and the corresponding handing-over of most of the work to local officers, can account for the limited survival of the project. In other words, the collection of statistics not implying some form of control seemed not to have a place in the type of government envisaged by the Tories.

The type and amount of control over events afforded by statistical information is open to question. If one of the purposes of statistical investigation is reliable prediction, then it provides a necessary, but not sufficient, condition for control. The hopeful 1880 submission of the Canadian Medical Association quoted Lyon Playfair as saying:

Registration of death represents the wrecks which strew the shore, while that of sickness would tell us of coming storms and enable us to trim our vessels to meet them. Till we have such a system of disease registration, public health cannot be administered with full intelligence.⁴⁸

It may be noted, however, that public health could not be administered with *full* intelligence also without, for instance,

reliable studies in the aetiology and prophylaxis of infectious diseases -- those studies, that is, that Pasteur only started in 1877. More in general, and using the standard nineteenth-century terminology, control was predicated upon the knowledge of facts and causes. From the point of view of the statistician, the latter could be reduced to the former: the knowledge of 'dry facts' would naturally imply the discovery of causes. Archibald Blue, the journalist and statistician who organised the Ontario Bureau of Industries (1882) and the Ontario Bureau of Mines (1891), and who was eventually called to Ottawa by the Laurier administration in 1900, put the case succinctly:

The value of statistics is apparent in this, that it is mainly through *the pursuit of statistical inquiries* we can be assured of real advance in the knowledge of human interests. The statistician aims at discovering the actual conditions of his country and *the causes* of that condition, with a view to discover also the methods of improving it.⁴⁹

Statistical information, then, was eminently factual information. In the context of an administration aware of the development of the new discipline and accustomed to gathering data for administrative purposes, the Canadian man of science was cast in the role of the supreme collector of facts -- the custodian of a nineteenth-century myth, the scientific fact. The results of the extension of the inductive method to human affairs, statistics in turn became, in the world of Canadian politics, the model of what an empirical, practical science, useful to government, ought to be.

The sciences that most approached the inductive model were those that clearly involved little theory, and mostly consisted in collecting, comparing, and classifying observations -- in short, natural history as distinct from natural philosophy. It is not surprising, therefore, to find that the sciences that found a place in the Canadian government were geology, meteorology, botany and zoology related to agriculture, and in particular entomology. It was not simply a matter of potential economic usefulness -- the knowledge of tides was just as obviously useful to shipping -- but also of similarity with certain governmental practices, traditional but latterly modernised, which were understandable by the layman, that is, the politician.

An additional reason rendered natural history acceptable to politicians: there existed a presumption, which the officers of the Royal Society of Canada did not share, that simple systematic observation led directly to application. The natural sciences, especially in their observational and taxonomic aspects, were widely held to be just an initial, rudimentary stage in the ideal hierarchy of the sciences. Without recurring to the philosophical scheme of progressive stages of higher sciences proposed by Comte, it may be sufficient to note that, at the meeting of the British Association in Montreal in 1884, British scientists, by broad agreement more advanced than Canadian and American, contributed almost all the papers for section A (mathematical and physical sciences) and B (chemistry) -- in all more than one-third of British contributions --

while the largest number of presentations by North American authors was in sections C (geology) and D (biology).⁵⁰ Sciences with an important theoretical content were considered higher and more advanced than empirical ones. Some members of the scientific community who accepted this hierarchy, such as the officers of the Royal Society of Canada, also held that useful applications could only follow theoretical, 'pure' studies. Sir Lyon Playfair, mistakenly taking the Royal Society of Canada to embody a widespread Canadian belief, praised the Dominion:

She knows that applied science does not come unless pure science precedes it -- that the applications of science only come from the overflowing of the fulness of science itself; and Canadians asked the promoters of science for its own sake to go amongst them and tell them how they must advance that science which has led to so many applications, and in that Canada showed great wisdom.⁵¹

But a different opinion, and one more in harmony with the peculiar perceptions of government, also existed. According to this view, the higher status of theoretical sciences was not questioned, but the natural sciences were judged more practical and useful than the others, just because they made use of a minimum of theoretical apparatus. This contention was usually put forward by men whose scientific environment was that of the local societies, and not so much that of universities. William Gossip, the president of the Nova Scotian Institute of Natural Science, pointed out in 1879 how all the industries of Nova Scotia were connected with, and could benefit from, natural science.⁵² G.J. Bowles, of Montreal, equated the beginning of a science with its applicative stage; speaking about the state of the science of entomology in Canada and the United States, he commented:

It is advancing in every respect. In Canada it is still in what we might call the *practical* stage -- the knowledge we have is being applied, as far as possible, to the promotion of agricultural interests.⁵³

He looked with diffident awe to the courage with which American entomologists ventured into theoretical fields:

In the United States the entomologists are doing good work in their different departments, and while the task of naming and describing is being rapidly prosecuted, some of them have leisure even to aim of changing the arrangement and nomenclature of science. All honour to them for their industry and zeal, though some of their projects are too revolutionary, even for the present changeful age.⁵⁴

'Naming and describing,' then, was the way of ascertaining useful scientific facts in the natural sciences. Canadian politicians, far from being willing to wait for abstract science to 'ripen' or to 'overflow,' as the various metaphors went, showed a marked preference for the most elementary information men of science could provide.

The debates over the function of the Geological Survey are a case in point. What the politicians tried to do, crudely put, was to stop the geologists from indulging in sophisticated work and get them to collect mining statistics. The substantive issues, regarding the role of geologists in the government's pay, were clouded in 1884 by a prodigious explosion of rivalries within the Canadian Survey. The geologists publicly accused each other of lying, plagiarism, incompetence, authoritarianism, insubordination and lack of integrity.⁵⁵ Principal Dawson's confident diagnosis was that the trouble was caused by the frustrated ambitions of Robert Bell and T. Sterry Hunt, 'designing and troublesome men.'⁵⁶ In practice, none of the accusations and insults stemming from personal antagonisms made any difference; nobody resigned or was dismissed as a consequence of the stormy atmosphere in which the hearings of the 1884 Select Committee of the House of Commons on geological surveys took place. As the chairman of the committee, the Conservative Robert W. Hall, stated, and as the final report shows, very little notice was taken of personal squabbles.⁵⁷ What was taken into account, and in the end affected the work of the Survey, was a complaint that had reflections outside the Survey itself. The department, it was alleged, had been left for too long without control and was producing scientific, 'theoretical' reports, and not enough useful information.

It is suggestive that the first complete articulation of this criticism in Parliament took place one year before the Select Committee was appointed, that is, the same year in which all the salaries of the members of the Geological Survey were placed on the Civil List, thereby freeing about one-half of the Survey's budget for further research expenses. The measure effectively increased the yearly grant from about \$60,000 to about \$91,000.⁵⁸ A stronger demand for political control accompanied the larger appropriation, so that more intimate links be formed between the scientific institution and the apparatus of civil government. The opposition, in the person of George F. Casey, the journalist from Western Ontario, put the case first:

If it is the practice of the Government to place an expert at the head of the Department, and leave him to do whatever he chooses, the hon. gentleman [J.A. Macdonald] could secure some land speculators in Winnipeg at very reasonable figures, if he would leave them to do the business of the Department without interference; and the work would be done thoroughly, but it does not follow that it would be properly done. Nor does it follow that because a man is a scientific man, he should know in which part of the country public policy requires surveys to be carried on; on the contrary, if a man is a scientific man, he is not likely to trouble himself about policy as much as about interesting scientific research. It might be a matter of great interest to him to know that Devonian strata existed at a certain place, without caring for the capabilities of the district for agriculture or stock raising; but that is the interest of the Government.⁵⁹

Casey, always an advocate of agricultural interests, declaredly wanted to reshape the Survey's activities so as to maximise the benefits to farmers. His plan included the collection and diffusion of information on the soil in the North-West, and the development of phosphate mining. The latter turned out to be a highly sensitive issue. In fact, every year since 1880 J.H. Pope, federal Minister of Agriculture, reported on the increasing demand for Canadian phosphates, mostly coming from the Ottawa region, on the British market. The Canadian mineral was transformed into superphosphate fertilizer in Britain, and then shipped to the United States and, in part, to Canada. Nobody, the minister complained, seemed to think of producing superphosphate for the American and Canadian markets right at the source.⁶⁰ In other words, phosphates were of immediate or potential interest to farmers, mining prospectors, and manufacturers -- which in turn made phosphates politically very interesting. For good measure, the Geological Survey seemed to be delaying the publication of H.G. Vennor's report on phosphate mining in the Ottawa Valley. The hold-up was connected with Vennor's dismissal in 1881, when he was found to have speculated in phosphate lands.

The Vennor case, in itself a minor administrative accident, became the catalyst that brought about political action. Casey's call for increased political control of the Survey, occasioned by the appropriation increase, and directed against useless scientific research, immediately acquired a referent: the Geological Survey was ostensibly delinquent in putting out a report that was not only practical, but also of potential importance to the three fundamental economic interests of the country. In February 1884, Robert N. Hall, the Conservative member for the mining district of Sherbrooke, moved that a select committee be appointed to examine the function of the Survey, and illustrated his reasons for doing so referring to the missing Vennor report, during the debate over the Supply Bill.⁶¹

The issues of administrative and political control, and of the usefulness of the Survey (summed up in the request for mining statistics) emerged during the work of the committee. J.A. Macdonald, who until 1883 also held the portfolio of the interior and thus was formally responsible for the geological department, admitted that all policy decisions were left up to the director, A.R.C. Selwyn; he would set priorities, choose the areas to be explored each year, allot tasks, and hire and fire all employees. Selwyn's own perception of his powers concurred with that of Macdonald.⁶² Like Casey in 1883, the 1884 critics of the Survey argued that the independence of the director should be curtailed; the Liberals were most vocal and explicit, but the request was also implicit in the recommendation contained in the report of the select committee, that the activities of the Survey be regulated either by further legislation or by departmental regulations.⁶³ Even one of Selwyn's personal enemies inside the Survey, Robert Bell, the future acting director (1901-1906), went on record as endorsing political control:

[E.C. Baker (Victoria)]. Do you think it would be advisable for the Director of the Geological

Survey, be he who he may, to have absolute power in the selection of his staff? -- [Robert Bell] Certainly not; that would be a dangerous power in any man's hands.

[E.C. Baker]. Do you not think that political influence, or the mere fact of its being a branch of the Civil Service, is detrimental to the work and to the welfare of the Department? -- [Robert Bell] Any interference might, or might not, be detrimental, but I think it is essential that the gentleman managing the Survey should be responsible to the people of the country, rather than to have an autocrat.⁶⁴

The task of the political head of the department, as it was envisaged, was twofold: to steer the government geologists' attention towards the study of resources useful for economic development, and to order the collection and distribution of mining statistics. The latter was at first considered by the select committee as a function that could possibly be performed by a new institution, separated from the Geological Survey; the consensus of the evidence collected, either by post or in *viva voce* sessions, and the committee's final recommendation was that the existing Survey be put in charge of the statistical work. A reason adduced was that there would be a large overlap between the new and old departments, both in expertise and activities; such duplication could be avoided by having a few mining engineers join the Survey with the explicit brief of dealing with statistics. A more interesting reason, however, was suggested to the committee by John Wesley Powell, the director of the US Geological Survey: the collection of mining statistics would provide a 'skeleton' for the scientists' work. Geologists, as distinct from mining engineers, would provide scientific and technical commentaries on the areas and topics pointed out by the engineers' economic statistics.⁶⁵

Thus various strands of thought and practice seemed to converge to produce a policy. Insofar as they were associated with administrative practice, statistics were known to be practically useful and to enable governments to intervene in selected areas of national life; the exemplary case was that of Nova Scotia, a province that routinely gathered reliable mining statistics in connection with the levy of a royalty. The same data, it was argued, could be of use apart from any tax-collecting purpose; they would provide investors and industrialists with information about the economic potential of Canada, and attract capital. Finally, as a discipline that dealt with 'facts,' statistics needed experts; by choosing the facts to be examined on the basis of economic relevance, it would make sure that the government geologists' expertise would be focussed on topics of manifest usefulness. In short, science, mediated by its extension to politics and human affairs, could find a precise place in government.

The main problem, as Selwyn knew for having experienced it when he tried to collect and compile mining statistics in the early 'seventies, was to obtain correct information from the owners

and managers of mines. They were liable to underdeclare in order to protect themselves against the possible imposition of a royalty, or they might overdeclare in order to attract investors. The work of compilation could not be accurate unless penalties were established for providing wrong information -- a measure already taken in the United States and in Nova Scotia. The lack of such powers somewhat hampered the work of the small Section of Mines, composed of two engineers, formed inside the Survey. In 1887 the first statistical report was published, presenting tables on exports, imports and production of minerals for 1886; some data could be reconstructed on the basis of existing records such as those of the Department of Customs and Excise, but those regarding more technical aspects of mining were at the mercy of the accuracy and goodwill of those mining operators that bothered to fill out the questionnaire sent to them by the Survey. A glance at the Survey's annual reports shows that the proportion of answered circulars steadily decreased in time. Thus the schematic policy that emerged from the work of Hall's select committee was only partly realised. The Section of Mines concentrated successively on individual areas or industries (iron, phosphates, natural gas and petroleum, etc.) and prepared complete technical and statistical reports on them; a series of yearly personal visits and an articulate system of classification of the information helped to make up, at least in part, for incomplete legislation.

The necessity of introducing penalties for failure to report (or false report), in order to obtain useful statistical data, became apparent as governments rationalised their procedures and extended their sphere of action during the 19th century. Britain, for example, started a programme of civil registration (births and deaths) with the creation of the post of Registrar-General in 1837, but introduced sanctions as late as 1874. By the 'eighties, however, the use of penalties was becoming an established practice. In the United States, the US Geological Survey was empowered in 1889 to collect statistics of mines; the same year, Ontario set a fine of \$40 for making a false return of information to the Bureau of Industries, a body set up, as it was characteristically phrased, to 'collect useful facts relating to the agricultural, mechanical, and manufacturing interests of the Province.' (45 Vic., cap. 5, Ontario).

In fairness, it must be recognised that the function of statistics envisaged by the Liberal government of Ontario was different from that of the federal Tory administration. Rather than trying to find a mediation between administrative practice and scientific expertise, the Ontario Bureau of Industries (which mainly dealt with agriculture) proposed to use information as the instrument that would remove all the obstacles to the smooth functioning of a free market. Quite possibly, the two outlooks partly adumbrated the different conceptions of government held by Tories and Liberals; it may be more profitable, however, to consider how the very nature of the agricultural sector could determine the function that economic and scientific information could have.

As has been mentioned above, the farmers tended to be suspicious of anything that smacked of bookishness or of government interference. Characteristically, the tolerated function of two

classes of outsiders was negative: scientists and politicians could be of service only as long as they could help to minimise, or better yet avoid, economic losses and disadvantages. These widespread feelings, together with the corresponding premium placed on self-reliance, self-determination, and ultimately, democracy, were traditionally represented in Ontario politics by the reform wing of the Liberal party. Accordingly, Archibald Blue articulated, and then realised in the organisation of the Ontario Bureau of Industries, the provincial Liberal government framework (as opposed to *dirigiste*) function in helping agriculture:

Every farmer knows that the price of his products is regulated by the law of supply and demand. Prices naturally tend to the equilibrium found under this law, and for a high price obtained under a false impression of scarcity the producer pays the penalty through prices running to the other extreme. The grain-dealer or the speculator on the corn-exchange, with a larger purse and better means of information than the isolated farmer, can learn the probable yield of crops sooner than anyone else, and may sweep the markets before prices have moved. But if statistics were furnished by the Government everyone would be as well supplied with information as the dealer or the speculator on the exchange. Hence the value of authentic reports on the condition of crops throughout the country and the world.⁶⁶

Accurate returns, the goal justifying the \$40 penalty eventually established, were meant to have a specific function -- one connected with the testing of new technical and scientific methods:

The value of information depends on its accuracy. An annual record of trustworthy facts, setting forth the productive power and value of both land and labour when employed to the best advantage, could not fail to produce healthy, stimulating effect. The influence of thousands of good examples would tell powerfully in favour of advancement all along the line. The counting of cows, a distinguished English agriculturist has remarked, is the first step towards their universal improvement.⁶⁷

The caution with which Blue expressed his faith in the progressive value of the statistical knowledge of facts and causes, was justified by the touchiness of agriculturists. Governments and parties, provincial and federal, trying to woo the farming vote needed to appear to be providing services without meddling -- without telling the farmers what was best for them. To this end, the particular use of statistics described by Blue, based on liberal economic assumption and directed against a traditional foe of the farmers, middlemen, met the need with creditable accuracy.

At the federal level, the 1884 Select Committee on agriculture considered the possibility of recommending a nation-wide scheme of agricultural statistics. The plan naturally recommended itself: it was one of the activities of the US Bureau of Agriculture, the model explicitly chosen by the Gigault committee, and it was ostensibly acceptable to the agricultural interest. Furthermore, the federal administration seemed to be the one best placed to obtain information not only from the entire national territory, but also from abroad, where Canadian produce could be sold and where the crops of other nations could influence commodity prices. Despite the fact that the evidence gathered by the committee by means of a questionnaire strongly supported agricultural statistics,⁶⁸ the idea received limited attention; of the two civil servants who discussed the issue, Archibald Blue not surprisingly praised the usefulness of the scheme but claimed that provinces could do the job best of all, while the Conservative farmer senior editor and co-owner of the *Montreal Gazette*, John Lowe, the Secretary of the federal Department of Agriculture, expressed the opinion that the expense of collecting accurate nation-wide data would be too high.⁶⁹ The final report recommended, almost as an after-thought, 'to initiate and carry out a convenient and comprehensive system of gathering the latest and most useful information, statistical and otherwise.'⁷⁰

Once again, as in the case of public health records, the only cheap way to obtain agricultural production data would have been to rely on provincial systems, which, in 1884-85, only existed in Ontario and Manitoba. Besides, as noted above, the particular type of statistical service acceptable for the farming community was more in tune with the political philosophy of the Liberals than with that of the Tories. As it happened, despite the complaints voiced yearly by successive ministers of agriculture, no plan of federal agricultural statistics was developed until well into the first decade of the twentieth century. This neglect amounted to a divorce between the recommended scientific and statistical activities, in contrast with the *modus operandi* sketched out for the Geological Survey. The 1884 Hall Committee (Geological Survey) produced a partially successful arrangement for the collection of mining statistics that would serve to orient the work of scientists, so that it may have a bearing upon economic activities. This may be labelled, for convenience, a 'Tory' way of using statistics, that is, as an instrument of government intervention. Conversely, the 1884 Gigault Committee (Agriculture) failed to generate a similar link between agricultural statistics and the scientific work of the proposed Experimental Farms. This was no doubt partly due to the fact that the type of statistics acceptable to the agricultural sector was, as argued above, of a framework or 'Liberal' kind. And, as shown in the case of health statistics, the Conservatives had little interest in schemes in which they did not have an administrative stake. The disagreement between farmers and government, however, also extended to the question of the kind of activity that the Experimental Farms would engage in.

J.A. Macdonald knew that the first and most troublesome question that would be raised in the House at the mention of a new item of expenditure was whether it would bring about financial gain. Accordingly, he re-interpreted the Experimental Farms' plan for the benefit of Parliament:

We intend to have a model farm; we will obtain teachers, and the farm is intended to be worked by the pupils. Those pupils will be self-sustaining. The hon. gentleman [Edward Blake, Opposition Leader] knows there are a great number of young men who are anxious to be educated as farmers, and who pay considerable fees to private teachers at this moment, in various portions of the country. There are gentlemen agriculturists who give handsome fees to be taught farming. No doubt, a Government farm, conducted on scientific principles, with competent teachers and a sufficient area to employ students, will be well attended, and the pupils will pay a reasonable amount for their education.⁷¹

Macdonald's remarks, although possibly comforting for those of his audience who believed that a research institution should make a profit, had a mindless ring. William Weld, the editor of the *Farmers' Advocate*, thought that the very gaucheness of the Prime Minister's attempt to parry possible criticism justified the suspicion that there was no policy, but only the desire to give jobs to party faithfuls.⁷² Weld thought he could see through the Ottawa government's desire to encourage agriculture:

Encouragement, in the long run, does not encourage. Yes, it does: it encourages tyranny in its basest form. It debases the will and the self-dependent spirit of a free people. It creates multitudes of dupes and lobbyists to be played upon by a corrupt government at the expense of the people.⁷³

It should be noted that the encouragement here envisaged and rejected was supposed to come from the activities of the experimental farm, after the projected statistical work had gone by the board. Indeed, since the actual birth of the agricultural branch of the federal Department of Agriculture coincided with the 1885 appropriation towards the establishment of a station for agricultural experiments, the above rejection was the direct outcome of the opposition to the very existence of the branch. It followed that even the scientific work of the station could be suspected of being an instrument of political interference, especially when the completion of the CPR in 1885, after the crisis of immigration into the North-West, seemed to promise renewed efforts to promote settlement in the prairies. In fact, after having been centred on the need to remedy the decrease in fertility of long-settled land, the discussions on scientific farming were beginning repeatedly to refer to the new problems posed by the western environment. The reports of John Macoun, the botanist and western explorer who joined the Geological

Survey in 1882, and of other members of the Survey such as Robert Bell, were among the evidence discussed during the sessions of the Gigault committee. The same reports were also the object of a short-lived but vicious attack of Henry Youle Hind, sometime professor at Trinity College, Toronto, and the geologist attached to the 1857-58 Canadian expeditions to the prairies, who accused the two authors of taking advantage of their scientific reputations to foster a grossly unrealistic favourable image of farming conditions in the North-West, in order to comply with government wishes.⁷⁴ Hind's allegations were doubtless motivated by an old grudge he nourished against the Geological Survey,⁷⁵ but they also pointed out some of the dangers of any excessively close links between the general policy of the federal government and research for agriculture. The experienced judgment of Alexander M. Burgess, Deputy Minister of the Interior from 1883 to 1897, made him oppose in later years the proposal of associating the multiplication of federal agricultural research stations with the spread of the railway system in the North-West territories:

Under no circumstances do I think it would be wise for the Government to assume the responsibility of telling the farmers what they ought to do and what they ought not to do. With intelligent, independent people to deal with the negative position is the safe one -- that is to say, make as public as possible the results of your Government experiments, but let each man judge for himself how far he will be guided by them.⁷⁶

Like the discussed but not realised statistical work, then, also the experimental and scientific work was cast in a 'framework' role. The corresponding role of men of science, as both collectors and sources of information, was not too different from that envisaged by the Master of the Dominion Grange, Squire W. Hill, when he saluted 'the sons of science [who] are scouring every heath, and prairie and wilderness, to see if some new grass lies hidden in some unexplored glade, if some rude stock of the first, can offer a new fruit to the hand of culture.'⁷⁷ The passage seems implicitly to refer to a type of institution which Canada, alone among British possessions, did not have: a botanic garden. But the expression itself was suspect: 'farmers do not like it; they think it is scientific nonsense.'⁷⁸

In the follow-up to the Gigault committee, the federal government accordingly steered a very careful course, attempting to avoid the opposing accusation of uselessness and meddlesomeness. The first move was an undisputed success; the appointment of James Fletcher as Dominion Honorary Entomologist in June 1884 fulfilled all requirements. As Fletcher himself testified, in his capacity as vice-president of the Ontario Entomological Society, insects destroyed yearly about ten per cent of the entire crop, for an estimated value of about twenty million dollars. Entomologists could recommend ways to reduce or eliminate that loss -- just the type of scientific information that could produce the economic effect described at the beginning of section 4. The American experience was a guarantee:

The United States Government is certainly not a Government to waste money upon a useless officer, but the United States has done more to support the service of entomology, and the study of economic entomology than any other country. If the expenditure thus entailed were useless, the United States would not be the country to enter upon it.⁷⁹

In the Canadian case, even expenditure could be minimised. Instead of hiring William Saunders, the president of the Ontario Entomological Society, as Fletcher recommended, Pope bestowed an honorary title upon Fletcher himself, who, as an accountant with the Library of Parliament, did not necessitate a special appropriation. Besides, as the son-in-law of Collingwood Schreiber, the man who succeeded Sandford Fleming as chief engineer of the CPR in 1880, the new Dominion Entomologist did not lack support in Ottawa.

William Saunders' turn came in 1885. In September of that year, a cabinet shuffle, occasioned by Sir Charles Tupper's resignation as Minister of Railways and Canals, brought John Carling, the brewer and businessman from London, Ontario, to the head of the Department of Agriculture. Carling was the man who, as Ontario Commissioner of Agriculture and Public Works until 1871, started the process that led to the opening of Guelph Agricultural College in 1874. One of the new minister's first acts was to request his fellow townsman and noted scientist, William Saunders, to visit agricultural colleges and stations in Canada and in the US, with a view to preparing a report that would be useful towards implementing the Gigault committee's recommendations.⁸⁰

Before the end of the year, Saunders travelled almost eight thousand miles and visited institutions in twelve states in the north-east and mid-west of the United States.⁸¹ The report he presented to the Minister of Agriculture, however, also included information obtained by correspondence from other stations and colleges in the US; a few sketchy pages on British and Continental examples were added at the end of the report, after the recommendations. These, in turn, contemplated one central experimental station of at least four hundred acres near Ottawa, and four 'sub-stations' that would respectively be located in British Columbia, the North-West Territories, Manitoba, and in one of the Maritime provinces. The scientific staff of the head office would lend their expertise to the more practically orientated personnel of the periphery.⁸²

Although it is clear that the American example was paramount in shaping the Canadian experimental farms, the Macdonald Government's explicit policy was at variance with the decentralising tendency initiated by the Morrill Land Grant Act. The difference was all the more remarkable for the coincidence of the discussion and acceptance of Saunders' scheme with the progress through the US Congress of the Hatch Act, a measure which firmly re-established the practice of decentralisation in agricultural research. William Brown, the director of the Ontario Agricultural College and long an opponent of a federal experimental farm, had no qualms about letting the Ottawa government know

about his preference for the American solution.⁸³ Likewise, the Liberal MP David Mills (a resident of London, Ontario, like Carling and Saunders) criticized the Saunders plan on constitutional grounds and, although not specifically referring to the United States, outlined an alternative very similar to the Hatch Act.⁸⁴ The 'Hatch-Mills' solution, involving federal grants to locally controlled institutions, would have disposed of the main reason for intervention adduced by the Tories: the inability of the smaller provinces and of the territories to find the large amount of funds needed for experimental research in agriculture. In other words, insofar as it kept the agricultural stations network under the control of Parliament and of the scientific headquarters of the central farm in Ottawa, the Conservative's choice reflected a precise political will.

It may be tempting to subsume the policies embodied in the two main federal scientific institutions, the Geological Survey and the Experimental Farms System, under the general heading 'diffusion of science.' The insistence on the value of factual information that can be noticed in all debates, and the amount of time, energy and money increasingly spent in preparing reports, bulletins and pamphlets, can lend some validity to such an interpretation. Yet the account would be incomplete. The very existence of a totally new environment -- the North-West -- evidenced the need for new knowledge; in other words, circumstances materially required the conceptual 'advancement of science.' Possibly, the conventional distinction between 'science for government' and 'government for science' would be more fruitful. Although very seldom either extreme exists alone, it is undeniable that, in Canada, the former was by and large the case. What has been said thus far about the two largest institutions, supports such a conclusion; the goals and restrictions of internal politics established the terms in which the policies for geological and agricultural research were framed. But it can be argued that, similarly, external politics -- insofar as Canada could have any -- were at the root of those other initiatives, in which the sponsorship of the federal administration seemed to be a case of 'government for science.' The granting of funds for the expenses connected with the International Polar Year of 1882 (\$4,000), the 1882 transit of Venus (\$5,000) and the 1884 meeting of the BAAS in Montreal (\$25,000), although not large appropriations, would appear at first glance to have been strictly for science's sake. But the first was a contribution to the transportation expenses of the entirely British expedition to Fort Rae; the second formed, as Charles Carpmael argued, 'a valuable addition to the British system of observations' by enabling Canadian observers to operate 'strictly in compliance with the instructions published for the guidance of British observers;'⁸⁵ the third grant was in aid of a celebration of imperial solidarity. In short, all these cases were the consequence of a double British connection, political (the only official external relation of Canada) and scientific (a substitute for internationalism). The general primacy of the political component was shown by the difficulties encountered by other schemes in obtaining federal sponsorship, despite the support of the British Association, when they were not a part of a broader imperial plan (ethnological research, study of tides), or dictated by the rationale of internal

politics.

The problem was that, for a government to sponsor science for science's sake, even if it were only one among diverse motives, there needed to exist as one of the terms of the intellectual and political life of the country a certain amount of faith, or trust, in the value of rationality. No such faith, or trust, was recognisable in the words or actions of the federal Tories. By way of contrast, faint traces of an old rationalistic mould could be detected, for instance, in the use of statistics envisaged by the Ontario Liberals, as well as, possibly, in the role outlined for the Geological Survey by David Mills in 1877; both cases, despite the drastically limited function allowed to scientific work, showed at least a recognition of the seminal virtue of scientific research. Not so, in the case of the Tories.

Clearly, the collaboration between members of a culture that valued rationality and system, and those of another based on expediency and rule-of-thumb required men of a special type -- more precisely, a special type of men of science.

NOTES

1. See, for instance, L.J. Burpee, 'Introduction' in the Anniversary Volume of the Royal Society of Canada, *Fifty Years Retrospect* (Ottawa, 1932), 1-8.
2. Canada, Parliament, House of Commons, *Debates* (7 April 1873) [H.C. *Debates*]65; (12 May 1873), 165.
3. Ibid. (15 May 1868), 707-8.
4. Ibid. (9 April 1874), 13; (20 May 1874), 114.
5. Ibid. (21 February 1876), 185.
6. L.A. Wood, *A History of Farmers' Movements in Canada* (Toronto, 1924), 93. *The Farmers' Advocate*, May 1876, 104.
7. M.W. Rossiter, *The Emergence of Agricultural Chemistry: Justus Liebig and the Americans, 1840-1880* (New Haven, 1975).
8. A.H. Dupree, *Science in the Federal Government* (Cambridge, Mass., 1957), chap. viii; 'Report of the Ontario School of Agriculture. . .for the Year. . .1875,' Ontario, Legislative Assembly, *Sessional Papers* [Sess.P.] 8 (1875-76), No. 13.
9. See, for instance, H.C. *Debates* (11 May 1874)[Gavin Fleming], 86; (24 March 1875)[George T. Orton], 889; and (5 April 1878)[Orton], 1709-19. For the Liberals' response, cf. (24 March 1875)[David Mills], 891' (21 February 1876)[Alexander Mackenzie], 183; and (8 March 1876)[Joseph Rymal], 523.
10. 'Report of the Minister of Agriculture. . .1873,' Canada, Parliament, *Sess.P.* 7 (1874), No. 9, iii; 'Report. . .1874,' *ibid.* 8 (1875), No. 40, ii.

11. 'Report of the Minister of Agriculture. . .1871,' *ibid.* 5 (1872), No. 2A, 3; 'Report. . .1873,' *ibid.* 6 (1873), No. 26, 3 and 117-18.
12. *H.C. Debates* (9 April 1874), 13; (5 April 1878), 1719.
13. A. Mayhew, 'A Reappraisal of the Causes of Farm Protest in the United States, 1870-1900,' *Journal of Economic History* 22 (1972), 469-75.
14. D.S. Nordin, *Rich Harvest: A History of the Grange, 1867-1900* (Jackson, 1974). See also D.H. Kelley, *Origin and Progress of the Order of the Patrons of Husbandry* (Philadelphia, 1875). Oliver Hudson Kelley is remembered as one of the fathers of the Grange in the United States.
15. L.A. Wood, *op. cit.*, 43, 30-35. *History of the County of Middlesex, Canada* (Toronto, 1889), 692, 715, 803.
16. M.C. Urquhart, ed., *Historical Statistics of Canada* (Toronto, 1965), table J34-44, 293-4.
17. L.A. Wood, *op. cit.*, 43. *The History of the County of Welland* (Welland, 1887), 477; see also H.R. Page, *Illustrated Historical Atlas of the Counties of Lincoln and Welland, Ont.* (Toronto, 1876), and *The Farmers' Advocate* (July 1874), 97.
18. *H.C. Debates* (9 April 1874), 13.
19. 'Report of the Minister of Agriculture. . .for the Calendar Year 1877,' *Canada, Sess.P.* 11 (1878), No. 9, vi-vii. See also the testimony of Joseph-Xavier Perrault to the Select Committee on Agriculture, House of Commons, *Journals* 18 (1884), Appendix 6, 129. Perrault was secretary of the Council of Agriculture of 1887, a Liberal, and a strong opponent of Confederation.
20. See *Ontario, Sess.P.* 9 (1877), No. 4, Appendix 3, 189.
21. R. Burnet, 'Second Prize Essay on "Where and How to Market our Fruit",' *ibid.* 8 (1875-6), No. 1, Appendix D, 302.
22. House of Commons, *Journals* 11 (1877), 49 and 55; *H.C. Debates* (21 March 1877), 889. Senate, *Debates* (19 March 1877), 270.
23. *H.C. Debates* (18 March 1878), 1211-18.
24. *Ibid.* (8 March 1882), 257.
25. House of Commons, *Journals* 16 (1882), Appendix 2, 14.
26. *H.C. Debates* (20 March 1884), 1007.
27. *Ibid.*, 1003.
28. *Ibid.*, 1007.

29. G.T. Orton to J.A. Macdonald, 23 and 29 May 1882, Public Archives of Canada [PAC], Macdonald Papers, pp. 108655-57 and 108802-05.
30. G.-A. Gigault, 'Reasons for Establishing a Dominion Experimental Farm,' MS Memorandum (February 1885), *ibid.*, pp. 145006-8.
31. *H.C. Debates* (30 January 1884), 74.
32. *Ibid.*, 75.
33. *Ibid.*, 75 [G.E., later Sir George, Foster].
34. House of Commons, *Journals* 18 (1884), Appendix 6, 217. 'The Proposed Bureau of Agriculture,' *The Farmers' Advocate*, November 1884, 323. See also A.H. Dupree, *op. cit.*, 170.
35. 'Report of the Select Committee Appointed by the House of Commons to Obtain Information as to the Agricultural Interests of Canada,' *Journals* 18 (1884), Appendix 6, 26.
36. *The Farmers' Advocate*, November 1884, 323.
37. A.G. Bogue, 'The Agricultural Press in Ontario in the 1880's,' *Ontario History* 38 (1940), 43-9. By the late 1880s, the *Farmers' Advocate* had a yearly circulation of about 225,000 copies. See also Bogue's 'The Fighting Farmer, William Weld,' *Western Ontario Historical Notes* 3 (1945), 75-8.
38. 'Agricultural Education,' *Farmers' Advocate*, November 1883, 326. Compare with almost exactly the same words in the testimony of R.W. Starr, of the Dominion Grange delegation, before the 1884 Select Committee on Agriculture, House of Commons, *Journals* 18 (1884), Appendix 6, 175.
39. 'Agricultural College for the North West,' *Farmers' Advocate* May 1883, 134.
40. *H.C. Debates* (11 May 1883), 1137. For reports of the expeditions, see *Sess.P.* 18 (1885), No. 9, Appendix 30, 189-228; 18 (1885), No. 13, 14; 19 (1886), No. 8, pt. iii, 15-18; 19 (1886), No. 11, Appendix 29, 194-202; 20 (1887), No. 15, Appendix 27, 197-213.
41. A. Baines, 'The History and Development of Statistics in Great Britain and Ireland,' in J. Koren, ed., *The History of Statistics* (New York, 1918), 371.
42. R.B. Kuczynski, *Birth Registration and Birth Statistics in Canada* (Washington, 1930).
43. 'Speech from the Throne,' *H.C. Debates* (13 February 1879), 5.
44. 42 Vic., cap. 21, s. 28-39. *H.C. Debates* (27 March 1879), 742 and (15 April 1879), 1234-7.
45. 'Copies of All Resolutions from Medical Conventions asking

- for Health Legislation,' *Sess.P.* 14 (1880-81), No. 98. A.H. Dupree, *op. cit.*, 259.
46. John Lowe to R.P. Howard, 4 February 1880, *Sess.P.* 14 (1880-81), No. 98, 13.
 47. *H.C. Debates* (12 April 1882), 847; (26 April 1883), 841; (19 May 1883), 1115-6; (5 May 1886), 1094; (11 February 1890), 498-504. 'Report of the Minister of Agriculture,' *Sess.P.* 25 (1892), No. 7, xlii-xliii.
 48. Quoted in 'Outline of a Scheme for the Registration of the State of Health,' *ibid.* 14 (1880-81), No. 98, 7.
 49. A. Blue, 'Agricultural Statistics: Their Value, History, Scope and System,' Ontario, *Sess.P.* 14 (1882), No. 3, Appendix G, 666. Emphasis added.
 50. BAAS, *Report* (1884). J.H. Lefroy, 'The British Association in Canada,' Royal Colonial Institute, *Proceedings* 16 (1884-85), 106. For the American agreement on the superiority of British science, see 'A Comparative Study of the Associations,' *Science* 4 (1884), 271-2.
 51. Royal Colonial Institute, *Proceedings* 16 (1884-85), 133.
 52. W. Gossip, 'Anniversary Address, 1879,' Nova Scotian Institute of Natural Science, *Proceedings and Transactions* 5 (1879-82), 107.
 53. G.J. Bowles, 'Address of the Incoming President of the Montreal Branch of the Entomological Society of Ontario,' Ontario, *Sess.P.* 8 (1875-76), No. 1, Appendix E, 336.
 54. *Ibid.*
 55. M. Zaslow, *Reading the Rocks* (Ottawa, 1975), especially chapter 7.
 56. J.W. Dawson to G.M. Dawson, 3 April 1884, McGill University Archives, Dawson Family Papers.
 57. *H.C. Debates* (9 April 1884), 1451 [R.W. Hall]. House of Commons, *Journals* 18 (1884), Appendix No. 8. One year after the debate, of the various members of the 1884 committee who had been hostile to the director of the Survey, A.R.C. Selwyn, only the Liberal Edward Holton still demanded Selwyn's head. See *H.C. Debates* (12 July 1884), 3346-8 and (15 July 1885), 3408-10.
 58. 'Public Accounts,' *Sess.P.* 17 (1884), No. 2, pt. ii, 106 and 18 (1885), No. 1, pt. ii, 106.
 59. *H.C. Debates* (9 May 1883), 1091.
 60. 'Report of the Minister of Agriculture,' *Sess.P.* 14 (1881), No. 12, ix; 15 (1882), No. 11, x; 16 (1883), No. 14, xi; 17 (1884), No. 14, xi-xiii. See also H.B. Small, 'Report on Canadian Apatite or Phosphate in Relation to Agricultural

- Uses,' *ibid.* 19 (1886), No. 10, 204-8. For the position of Canadian phosphates in 19th-century world trade, see A.N. Gray, *Phosphates and Superphosphate* (London, 1944), 24.
61. *H.C. Debates* (1 April 1884), 1262.
 62. *Ibid.* (9 May 1883), 1090 [J.A. Macdonald]. 'Report of the Select Committee. . .as to Geological Surveys,' *Journals* 18 (1884), Appendix 8, 13 [A.R.C. Selwyn].
 63. *H.C. Debates* (9 April 1884), 1452 [A. Mackenzie, David Mills] . 'Report of the Select Committee,' 11.
 64. *Ibid.*, 90.
 65. J.W. Powell to R.N. Hall, 12 April 1884, *ibid.*, 205-6. The USA inaugurated a system of mining statistics in 1882.
 66. A. Blue, *op. cit.*, 668.
 67. *Ibid.*, 667.
 68. 'Report of the Select Committee Appointed by the House of Commons to Obtain Information as to the Agricultural Interests of Canada, *Journals* 18 (1884), Appendix 6, 4.
 69. *Ibid.*, 103 [John Lowe] and 200 [Archibald Blue].
 70. *Ibid.*, 23.
 71. *H.C. Debates* (16 July 1885), 3453.
 72. 'Political Farming and Dairying by the Dominion Government,' *Farmers' Advocate*, September 1885, 259.
 73. 'Government Expenditure for Agricultural Purposes,' *ibid.*, November 1885, 323.
 74. H.Y. Hind to A.R.C. Selwyn, 13 April 1883, and Hind to J.A. Macdonald, 16 April 1883, PAC, RG 15, vol. 288, file 61147.
 75. See Zaslow, *op. cit.*, 106-7 for an earlier incident.
 76. A.M. Burgess to T.M. Daly, 8 November 1893, PAC, RG 15, B-12, file 328467.
 77. [S.W. Hill], 'Meeting of the Dominion Grange. The Worthy Master's Address,' *Farmers' Advocate*, December 1875, 241.
 78. 'Report of the Select Committee. . .on Agricultural Interests,' *Journals* 18 (1884), Appendix 6, 118 [Charles Gibb].
 79. *Ibid.*, 156 [James Fletcher].
 80. John Lowe to William Saunders, 2 November 1885, *Sess.P.* 19 (1886), No. 10, 211-12.
 81. Saunders to Lowe, 1 and 6 January 1886, PAC, RG 17, AI, files 50.918 and 51.040.

82. W. Saunders, 'A Report on Agricultural Colleges and Experimental Stations, with Suggestions Relating to Experimental Agriculture in Canada,' *Sess.P.* 19 (1886), No. 19, Appendix 54, 268-82.
83. Memorandum, dated 2 October 1886, PAC, RG 17, I-1, vol. 495, file 55.595.
84. *H.C. Debates* (30 April 1886), 962, and (7 May 1886), 1146-50.
85. C. Carpmael, 'Interim Report on the Work Carried on in Connection with the Observations of the Transit of Venus,' *Sess.P.* 16 (1883), No. 7, Appendix 27, 184. Carpmael's second-in-command in the Meteorological Service, the Deputy Superintendent Lieut Andrew R. Gordon, RN, went to Oxford to be trained by Edward J. Stone, Radcliffe observer and director of the British expeditions, see *ibid.*, 183.