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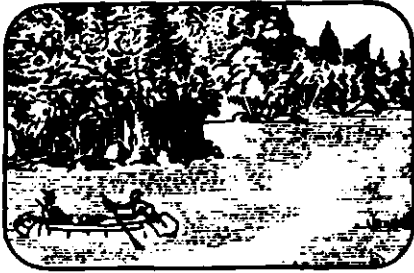
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Features



History of Canadian Geology

Thomas Roy (? - 1842): An Early Engineer-Geologist

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Sir Charles Lyell paid his first visit to North America in 1841 and 1842. Towards the end of his stay he crossed the border into Canada, at Niagara Falls, and travelled as far east as Quebec City. He spent three days in Toronto in mid-June 1842. In the second volume of his *Travels in North America*, he relates that "(he) found Mr. Roy, the Civil Engineer, expecting me and started with him the morning after my arrival, to examine those ridges of sand and gravel, and those successive terraces, at various heights above the level of Lake Ontario, of which he had given an account in 1837 to the Geological Society of London" (Lyell, 1845).

The idea of a civil engineer acting as a guide to Sir Charles Lyell, and contributing a paper to the Geological Society of London as early as 1837, suggested that Thomas Roy must have been an unusual man, his life worthy of study. Reference to the 1837 paper provided a starting point; its contents confirming the originality of Roy's thinking to such an extent that, although

little has yet been found about the man himself, it may not be inappropriate to bring his work to the attention of readers if only by way of what is little more than a progress report.

The paper is to be found, in summary form, in the second volume of the Proceedings of the venerable London Society. It is entitled "On the Ancient State of the North American Continent." It was presented at a regular meeting of the Society on March 22, 1837, the reading of the paper being concluded at the next meeting, two weeks later, on April 5. The author is noted as Thomas Roy Esq., Civil Engineer, so that it is not surprising to find the paper opening with these words: "The author having in the course of his professional duties, discovered in the lake district of Upper Canada terraces or level ridges which agreed in elevation at considerable horizontal distances, he was induced to extend his inquiries and ascertain how far similar phenomena have been observed in other parts of North America - what may have been the probable extent of the lake or sea by which the ridges were formed - and by what operations the waters were drained off, leaving only the present detached Canadian lakes."

Mr. Roy explains that he had "traced upwards from Lake Ontario the successive ridges or terraces, and ascertained that their greatest height was 762 feet above the lake" and he then assumed "that the boundary of the ancient sea must have had an elevation of at least 1,000 feet (above sea level)". After suggesting what he thought might have been its boundaries, he concludes that its area might have been 960,000 square miles.

He then describes the soils encountered north of Toronto, especially on the main "ridge" to the south of Lake Simcoe, noting the "great

variety of boulders, many of them of immense size, and for the greater part derived from primary or transition formations. Many of them are rounded, and others decayed by weathering, whilst the edges of some are perfectly entire. On the southern side of the ridge boulders are not so common." Coming close to the true explanation, he "conceives" that the ridges (and boulders) may have accumulated in a manner similar to that "in which drifted matter is now disposed along the margin of the lake at the breaking up of the ice."

Finally, Mr. Roy calculated "the quantity of water hourly discharged by the Saint Lawrence, the Mississippi and the Hudson, . . . (and) . . . proceeds to show, that in order to reduce the ancient lake by 30 feet, the distance between two of the highest parallel ridges, fifteen years would be required, supposing the discharge to be double that at present." The summary concludes with these words: "Mr. Roy next details with considerable minuteness, the processes by which he supposes this vast sea was drained; but as his description cannot be successfully followed without the aid of diagrams, they do not admit of being given in the Society's Proceedings" (Roy, 1837).

Adding interest to this report of what was clearly an outstanding paper of the time is the fact that it was presented to the Society, in the absence of the author, by Charles Lyell Esq., F.G.S. One naturally wonders if Lyell knew Roy in 1837 or whether he just happened to be chosen to present this paper from across the Atlantic, in view of his active interest in the new Society. It is entirely probable that Roy received his training as a civil engineer in Great Britain, much of the early engineering work in Canada being carried out by men so trained. No trace has yet been found, however, of any record of Roy's life or work in the

United Kingdom, nor does the Geological Society have any copy of the paper or information about its author.

The search has therefore had to be continued in Toronto. It was only on March 6, 1834 that the small town of "Little York" (sometimes referred to as "Muddy York") had been incorporated as the City of Toronto. It was then expanding rapidly. Despite its pioneer character and small size a local "Directory and Register" was being published. The issue for 1837 records that Thomas Roy, a civil engineer, was living on Peter Street but there is no mention of him in the corresponding volume for 1833-34 (Register, 1837).

Some early records of the City Council of Toronto are in the custody of the Archives of Ontario and these include eight letters and one report by Thomas Roy. The first letter, addressed to the Hon. The Mayor of Toronto, dated March 6, 1835, is an application for the position of engineer to report, with another engineer appointed by the governor, on Toronto Harbour. In the course of this letter, he says "When I came here in July last . . ." indicating his arrival in Toronto in July 1834 (Roy, 1835). His address, given on the letter, was 225 King Street.

On August 3, 1842, another civil engineer, Robert A. Maingy, addressed a letter to the Hon. H. Sherwood, Mayor of Toronto, from Kingston in which he says that he has "observed in one of the papers the announcement of Mr. Roy's death" and proceeds to solicit his appointment for "the charge of any works that may be undertaken by the Corporation . . ." (Maingy, 1842). This suggests that Thomas Roy occupied some sort of official position as Engineer to the City at the time of his death. It will be noted that this took place but a few weeks after the visit of Lyell.

Although early Canadian newspapers regrettably provide very little local news in their pages (usually filled with small advertisements and reprints of news reports from London and other European papers), the Toronto papers did take note of Mr. Roy's death. This notice appeared in both *The British Colonist* and *The Toronto Patriot*: "At his residence, Newgate Street, on the 28th. ultimo, Thomas Roy, Esquire, Civil Engineer. The death of this gentleman will prove a public loss, as he not only planned and carried into execution the various public improvements which

have raised this city to its present state of prosperity, but he has for years past employed himself in examining into the geological features of the Province, and sometime since presented to the government a geological section of the country passing from the coal field of Pennsylvania through the Niagara District and the Home District to the Granite Rocks beyond Lake Simcoe. During the late visit of Mr. Lyell, the Geologist, to this city, Mr. Roy was his constant associate whilst examining the country; he warmly entered into Mr. Roy's views, and expressed himself quite astonished at the important and valuable results of his unaided, unheeded, and unrewarded labours" (British Colonist, 1842). The only identification on this obituary notice is the word "Com" at its conclusion. Since the same notice appeared in the two newspapers, with identical wording, this may have been the tribute of a friend.

Lyell's first North American visit will be described in the second volume of Professor Leonard Wilson's magisterial *Life*, the first volume of which has already won such wide acclaim (Wilson, 1972). After the second volume has appeared, it may be possible to have a more detailed account of Lyell's field work with Roy in the Toronto area since there are frequent references to Roy in the relevant notebooks, copies of which Dr. Wilson has kindly allowed me to examine. At this time, however, it can be said (with Professor Wilson's kind agreement) that nothing in Lyell's notebooks gives any clue to Roy as a man, nor is there any indication of his being in ill health during those busy days with Lyell in June 1842.

No trace of the geological section has yet been found but the search for this continues. Roy's report on Toronto Harbour, however, is in the Archives of Ontario. The harbour is geologically distinctive since it is formed by one of the largest compound recurved spits on the great lakes, littoral drift from the Scarborough Bluffs to the east having gradually built up Toronto Island, through inter-action with the Don River, as an ideal protective barrier. The report is a 23 page handwritten account of a careful survey, carried out with Lieutenant Bonnycastle of the Corps of Royal Engineers who were then contributing so much to early Canadian engineering. There is some discussion about the formation of the Island but,

surprisingly, no reference to the action of littoral drift as the major source of the island-forming material (Roy, 1835).

Roy had one other publication, a small pamphlet entitled "Remarks on the Principles and Practice of Road-making as applicable to Canada". There appears to be but one copy of this still in existence, as listed by the National Library of Canada, a fragile treasure of the Central Library of Metropolitan Toronto. Printed in Toronto in 1841 by H. and W. Rowsell, Printers, it is a small paper-backed leaflet of 42 pages being dedicated, in the custom of the time, to the Governor General of North America, Baron Sydenham (Roy, 1841). It is one of the most remarkable publications of its kind that the writer has ever seen, its remarks on drainage of roads, soil studies, compaction of soil all being as if written yesterday. The geological references are incidental only so that more detailed reference here to the contents would be inappropriate. Indicative of Roy's active mind, however, is this percipient statement, in his introduction: "It is often said, why lay our large sums upon common roads; they will soon be superseded by Railways? . . . the probability that railways may be rivalled by steam-carriages upon common roads (is) no chimerical idea." And this is 1841.

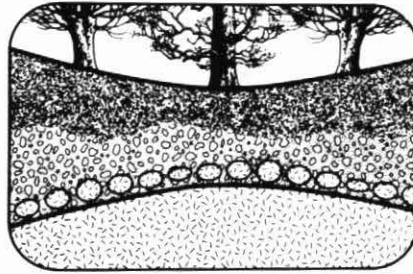
The young officer of the Corps of Royal Engineers with whom Roy worked on the report upon Toronto Harbour had a distinguished career in his Corps (in which he became a Lieutenant Colonel). As Sir Richard Henry Bonnycastle he wrote a two volume work entitled *Canada and the Canadians* which was published in London in 1846. This is a delightfully discursive book giving many interesting sidelights of the Canada of those days as seen through the eyes of a keen British observer. He, too, refers to the raised beaches at Toronto, and so to Thomas Roy. His words may fittingly bring this note to a close. "Lyell visited these (beaches) with the late Mr. Roy, a person little appreciated and less understood by the great ones of the earth at Toronto, who made an excellent geological survey of this part of the province . . . and no one has done him even a shade of justice, but Mr. Lyell, who, having no colonial dependence, had no fears in so doing" (Bonnycastle, 1846).

Note. This paper was presented orally at the annual Meeting of the Geological Society of America, Salt Lake City, October, 1975.

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Soil Column

Soils and The Archeologist

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The archeologist, in common with the geologist and the pedologist, is largely concerned with subsurface features. In his work the archeologist has benefitted considerably from the fact that when man abandons a habitation site it is frequently buried by one or more natural processes. Consequently, when an archeologist wishes to obtain information about a past civilization he invariably has to dig for it (Fig. 1.) One would therefore expect that a very profitable tool at the archeologist's disposal would be the physical and chemical composition of the soil, the preserving medium. Instead, we find that, with relatively few exceptions, surprisingly little use has been made by archeologists of the techniques of soil analysis. Furthermore, few attempts have been made to study such soils with a view to using them as indicators of environmental impact by previous civilizations.

Artifacts and Disturbed Soils

In Canada, and especially within those areas that have been used for agricultural purposes, features of man's earlier settlements are rarely recognizable at the surface. Frequently, the first sign that a site has been previously inhabited is the presence of various human artifacts within the plough layer. At sites where the vegetation has subsequently reverted to a semi-natural state the morphology of soil profiles will often indicate the depth of physical disturbance caused by previous human

activity and resulting in the disruption of the soil's A and B horizons. Additional evidence of soil modification by early man is often provided by the effects of accelerated soil erosion causing the truncation of contemporary soil profiles and the burial of other soils downslope under slope deposits.

Of course, an essential prerequisite to the evaluation of such soil disturbance is a detailed knowledge of the natural and undisturbed soils in such areas. Studies of certain soils developed from sandy parent material of fluvio-glacial origin in parts of southern Ontario, that have been preserved as a result of being buried either beneath middens (refuse dumps) or beneath slope deposits downslope from an abandoned Indian village, suggest that the natural soils prior to the Indian occupancy approximately 350 years ago were well developed Podzols. In contrast, the present day undisturbed soils in the same area are only weakly developed Podzols which have perhaps formed as a result of further soil development subsequent to forest clearance by early Europeans.

Chemical Relicts

The preservation of the remains of physical structure in the ground such as post holes, pits, and hearths, together with the artifactual material within soils, undoubtedly facilitates archeological interpretation, but perhaps even more important is the fact that the soils presently covering archeological sites also contain a chemical record of past human activities.



Figure 1
Soil sampling at an archeological site