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JOHN GOLDIE IN NORTH ANERICA
PART 1: Niagara Falls and the Theory of Evolution

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Among the many travel diaries, collecting journals and other literature written by natural historians who visited Niagara Falls in the Nineteenth Century is a slim volume by the botanist John Goldie. The diary contains his observations on a trip in 1819 when he was twenty-four years old to what was known as Upper Canada and "Some of the New England States" including western New York. Mr. Goldie's name has come down to us commemorated in the fern *Dryopteris goldiana* (Hooker) Asa Gray, better known as Goldie's Fern. The original diary is curated by the Toronto Public Library. An edited version appeared in print in 1897, and a summary of his experiences was published in the *Journal of the Edinburgh Philosophical Society* in 1822 (Spawn, 1961).

Goldie's diary is interesting because he came to the North American continent from Scotland just before many of the Victorian Ages' major scientific accomplishments were achieved, and before the major actors of the period came on stage. This was Goldie's first professional challenge and his mind was fresh with the expectations of his recent schooling, at that point based mostly on the authority of books and teachers, rather than that of his own experience. It was out of Scotland that Niagara received scientific attention of some international consequence in the early and later Nineteenth Century.

The distinguished botanists Sir William J. Hooker and his son Sir Joseph Dalton Hooker both were to have interests in Niagara Falls. The elder botanist was director of the Glasgow Botanic Gardens where Goldie received his education, and he underwrote Goldie's North American trip and the following publication in the *Philosophical Society*. To the elder Hooker is attributed authorship of the fern named after his protege. David Douglas, another Scot, would visit Niagara Falls in 1823 as part of a North American trip sponsored by the Royal Horticultural Society, and whose specimens from Niagara were cited in Hooker's *Flora Boreali-Americana* (1840; Zenkert, 1934). Sir Joseph Dalton Hooker, later to become director of Kew Gardens, himself visited Niagara Falls in the company of Dr. Asa Gray in 1877, and later delivered an address before the Royal Institution of Great Britain a year later, citing the flora of Goat Island as one of two excellent examples of the distinctive richness of the Great Eastern Forest region of the United States (Turrill, 1953).

It is difficult, from the vantage of two centuries, to imagine a well educated natural historian, or scientist, such as young Goldie was, to have entertained a world view which organized the biological world according to patterns other than the ones we take for granted today, with our classifications reflecting evolutionary relationships among organisms. Every time we use binomial nomenclature, such as *Dryopteris goldiana*, to name a species, we are using a name in which is hidden the modern taxonomist's decision on the evolutionary relationship of Goldie's new fern to other existing ferns.

Yet in Goldie's day, species of plants and animals were organized under a completely different system of relationships. The profound change in biological thinking which began to take definite form in Goldie's generation had just begun. For details regarding the nature of early systems for organizing the organic world, I refer the reader to a treatment of the subject by Loren Eiseley (1961), but it may be sufficient to state that in Goldie's day heresy still controlled the boundaries of scientific thinking. Theory must not contradict religious edict. I can only suggest the significance of some of Goldie's interesting comments in his diary with particular reference to his experience when visiting Niagara Falls, and review how Niagara Falls came to be used as a natural timepiece against which theories based on premises involving great vistas of time could be demonstrated.

It was because Goldie approached the Falls from the north, from York (the area around Toronto), with his mind full of pleasant apprehensions derived from the literature he had read, that he made the interesting exclamations forming the introduction to this paper. At Queenston, Ontario, he, perhaps like any young man living in the age of Napoleon, was "anxious to get upon the field of battle" - the Battle of Queenston Heights - to walk upon the recent battle grounds of the War of 1812, which had concluded with the Treaty of Ghent in 1814, and to meditate upon the death of the Englishman General Brock and the "fruits of Pride and Ambition" motivating the still rather unformed American nation to attempt to add further British dominions to their territory.

The geography Goldie began to encounter as he mounted the Heights above Queenston astonished him - not because of their intrinsic nature, but because of the gap between his expectations and the reality before him. The almost secluded concentration of erosive power in the narrow but relatively deep gorge of the Niagara River amid flat tableland gripped his intellect. As soon as he breasted the top of Queenston Heights his unbelieving eyes saw that "instead of there being a declivity, it was all level to the South & West. - "There is no perceptible rise in the land all the way to Lake Erie . . . so that it seems as if the Falls had been originally at this place."

Even before Goldie climbed the escarpment up from the lake plain, he beheld the watergap, the entrance to the two hundred feet .or so of gorge depth that lay before him. "This ridge [which he later understood to be instead the wall of the tableland to the south] is continued of exactly the same appearance on the opposite side of the river, and look as if at some period they had been joined." Goldie was observing the continuity of rock strata exposed on facing or matching gorge walls, highly evident here due to the increased north-facing exposure of bright red layers of shale and sandstone. The stratigraphy of Niagara Falls struck him immediately - a situation which would not have happened had he arrived from the south.

The modern science of geology, particularly that of the processes of stratigraphy and sedimentation, had just begun to be profoundly revised, notably through study by one of his countrymen, James Hutton, and Goldie was able to speculate on the "origin" of Niagara Falls from observations of rock features, and to formulate the temporal idea of a "period" preceding the existence of the Falls itself.

To what do we attribute Goldie's astonishment at the levelness of terrain? "Instead of high rocks & precipices above the Falls, and low valleys & glens below them, all is perfectly level to appearance . . . there is nothing to be seen in the banks of the River that would lead you to expect any such thing as Falls at this place." Indeed, "there is no perceptible descent in the ground all the way from Lake Erie to Queenstown so that the height of the falls is caused by the greater depth of the bed of the River below than above them."

On the thirteenth of July, Goldie took the bridge over to Goat Island and stood looking down into the boiling cauldron of the plunge pool. The bridge had only been opened a year or so before, so Goldie may have been the first botanist of note to visit the previously inaccessible island. "It is a singular circumstance how the solid rock came to be cut to so great a depth, all the surrounding country being level - From viewing the country here a Person would readily conclude that the Falls originally were at Queenstown - But the time requisite for their receding so far, by the wearing of the rocks, would be a vast deal more, than, what we believe to be the duration of this earth in its present form - People who live here inform me that in the space of 30 years passed the Horse Shoe Fall has assumed its present shape from being nearly straight - Should the World continue as long as they will require to go two or three miles up the river then the Falls will be completely destroyed, for above that the bed of the river is not composed of rocks but sand."

Here is the crux of the matter; time. How far away in time the origins of things are is a question fundamental to a perspective on the relationship between the present and the Beginning and, of course, the End. Goldie, a devout Scottish Christian, saw the Beginning in God's seven-day creation, and the ending in the Day of Judgment - an event which could very well happen before Niagara had time to erode upriver into softer sediments and collapse into rapids. Goldie saw that the evidence of Niagara Falls favored the great epochs of time required to explain all geological phenomena, evidence which would be fundamental to explaining the upcoming biological theories which would also require epochs to be consistent.

The young John Goldie was a naturalist who lived in a "pre-Darwinian" time. As a young man, he appeared to be interested, although at arms length, in the revolt of the British colonists on the east coast of North America and their further outrages against the British crown beginning in 1812. Even as he protested, in his diary, the abuses of the disloyal or revolutionary colonists, he watched with interest. As a devout Scots Christian and an intellectual, he may have also have observed with similar interest the blasphemous theories in the natural sciences which demanded more time for the workings of natural processes than allowed in the few millennia the Christians had been willing to acknowledge during the past two thousand years of European history (Eiseley, 1961). Bishop James

Ussher's formulation, written around 1650 and based on accumulated inferences in the Bible, had placed the beginning of the world at 4004 B.C. The literal interpretation of the Bible was becoming increasingly difficult to integrate into scientific observations of the earth and solar system.

Since the world began, for Goldie, catastrophically (in seven days), most grand natural features owed their awesome sublimity to God's power. Huge short-term cataclysms were postulated to have thrown up the world's mountains and vast ocean deeps. But Goldie saw the cataclysmic environment of Niagara arising not in a tortuous terrain of faults and volcanics, but of flat, smooth, undisturbed farm and woodland. The regional flatness from continental glaciers and the Ice Age would be devised later in the century by Louis Agassiz - who also visited Niagara Falls, but for those of Goldie's time, the flat terrain studded with boulders bearing little relationship to the region's bedrocks was evidence of the scouring influence of episodes of great floods.

James Hutton (1726-1797), considered the father of historical geology, was also a Scotsman. He had written his *Theory of the Earth* in 1785 and in it he had formulated "the discovery of time in the last decade of the Eighteenth Century," just as infinite space had been formulated in the seventeenth - the, product of astronomical discovery (Eiseley, 1961). Hutton had laid down scientific rules by which earth processes occurred, emulating those of Newton for physics, and had substituted natural for supernatural forces to explain the perceptible phenomena of the earth. The subtle, eternal processes of erosion were central to much of the length of time required to explain the existence of particular landforms. Niagara's more spectacular erosion events would be much more easily calibrated than the minute changes of sediment in the Scottish streams in which Hutton observed models of the geological processes he described. John Goldie was educated in Scotland. Perhaps it was the challenge of Hutton's ideas, published in two volumes in 1795, three years after Goldie was born, that was to color Goldie's impressions as he viewed the Falls in 1819. Hutton read his own *Theory of the Earth* before the Royal Society of Edinburgh in 1785 and published this paper in their *Proceedings* in 1788 (Eiseley, 1961). Goldie also appeared in a publication of that Society, in 1822, with an account of his two year experiences in North America (Spawn, 1961).

Geology was to provide a means of calibrating periods of earth-time by systematizing evidence of life and its organization contained in the rocks (fossils). Geology set the time required for the development of life forms throughout the duration of the planet. These ideas were essential to the framework of time and development and living processes later articulated by Charles Darwin in his theory of the evolution of living things.

There may have been no intellectual relationship between John Goldie and his contemporary Charles Lyell (1797-1875) who was a few years Goldie's junior other than their familiarity with Hutton's thinking. Lyell's *Principles of Geology* was to "destroy the reigning geological doctrine and introduce unlimited time and the play of natural forces once more into geology" (Eiseley, 1961). Lyell was to have a profound effect on the formative thinking of Charles Darwin, in many ways his protege. Lyell, in addition to his geological interests, wrote on issues of biology, formulating the ideas of competition between all organic beings, the "struggle for existence." He

"anticipated Darwin in the recognition of ecological change which could promote extinction" (Eiseley, 1961). It would take Darwin, however, to "grasp the principle [of evolution] in its full creative role" (Eiseley, 1961). The issue of recession rates of Niagara Falls, loose (recent) riverbed sediments on the banks of the Niagara River at Goat Island and the Silurian (Niagara group) fossiliferous beds exposed in the Niagara River Gorge were to provide evidence of three time-frames by which other events could be correlated, and Charles Lyell and his collaborator, the American geologist and paleontologist of the New York State Geological Survey, James Hall, were to investigate all three at Niagara. It was Hall who systematically worked out the fossil sequences in the Niagara Gorge during 1837-1843 (J. M. Clarke in Grabeau, 1901).

Charles Lyell came to Niagara in 1841. There Lyell saw "a chronometer measuring rudely, yet emphatically, the vast magnitude of the interval of years, which separate the present time from the epoch when the Niagara flowed at a higher level several miles further north across the [North American] platform ..." at Queenston, Ontario and Lewiston, New York, as Goldie had suggested before, Lyell and Hall explored the sediments on Goat Island and the terrace on the adjacent mainland, determined the sources of the sediments upstream at Buffalo, from glacial debris, and the recent ages of the buried shells (the "testaceous fauna"). Mixed with these shells of species still living in the river then, and today, were found remnants of a Mastodon - an Ice Age mammal long extinct in the region, and in the world. This evidence suggested " . . . how far the two events before confounded together, the entombment of the Mastodon, and the date of the first peopling of the earth by man, - may recede to distances almost indefinitely remote from each other" (Lyell, 1855), And yet, for all the great age of Niagara's sediments and erosive development, compared to other strata explored in other areas of the earth, Niagara is young: "... however much we may enlarge our ideas of the time which has elapsed since the Niagara first began to drain the waters of the upper lakes, we have seen that this period was one only of a series, all belonging to the present zoological epoch; or that in which the living testaceous fauna, whether freshwater or marine, had already come into being. If such events can take place while the zoology of the earth remains almost stationary and unaltered, what ages may not be comprehended in those successive tertiary periods during which the Flora and Fauna of the globe have been almost entirely changed. Yet how subordinate a place in the long calendar of geological chronology do the successive tertiary periods themselves occupy! How much more enormous a duration must we assign to many antecedent revolutions of the earth and its inhabitants" (Lyell, 1855),

Such revolutions describe the evolution and extinction of floral and faunal assemblages, the present mechanisms and living evidences of which were to be detailed in Darwin's Origin of the Species and related works. Recognizable present-day organisms can be found in old sediments - how much older must be fossils representing organisms which had "come into being" and vanished bearing no representation to any living creature? Surely all species did not come into being at one time, and become extinct - this is a process that has gone on throughout previously inconceivable periods of time, and the present is only a recent expression of this living process of biological change. Lyell used the vastly older petrified sediments of Silurian rock expose in the gorge limestones and dolomites as models to

compare to the distances of the cosmos discovered by astronomers in the century before his own, based on calculations of the earth's orbit, the distance of the sun to the nearest star and to "luminous clouds" in the night sky. "To regions of space of this higher order in point of magnitude, we may probably compare such an interval of time as that which divides the human epoch from the origin of the coralline limestone over which the Niagara is precipitated at the Falls. Many have been the successive revolutions in organic life, and many the vicissitudes in the physical geography of the globe, and often has sea been converted into land, and land into sea, since that rock was formed " (Lyell, 1855). Amadeus Grabeau, the well-known stratigrapher and sedimentologist, who issued publications for a time through the Buffalo Society of Natural Sciences, briefly described the subsequent geological interest in establishing the age of the Falls: "The length of time required for the excavation of Niagara gorge is not merely of local interest but serves as a basis for estimating the length of time since the disappearance of the Laurentian glaciers from this region, and incidentally it has served as a chronometer for approximately measuring the age of the human race on this continent" (1901). The age of the gorge, based on a variety of evidence, is presently estimated at 12,300 years (J. C. Bastedo in Tesmer, 1981).

John Goldie may have been a small actor on the stage of scientific advancement in the first decades of the Eighteenth Century. As he stood on the brink of the Niagara River on the soil of a young, rebellious nation, looking down into the chaos of the plunge-pool of the Falls, he may have seen the great challenges to civilization in the years ahead. That he welcomed those changes may be inferred from the fact that in 1844 he took his family and emigrated to North America from the land of his birth. He settled in Waterloo County, Ontario.

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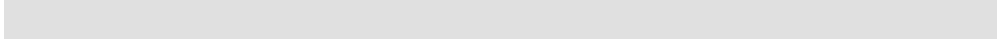
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APPENDIX II.

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JOHN GOLDIE IN NORTH AMERICA **PART 2: BOTANICAL AND GENERAL OBSERVATIONS**

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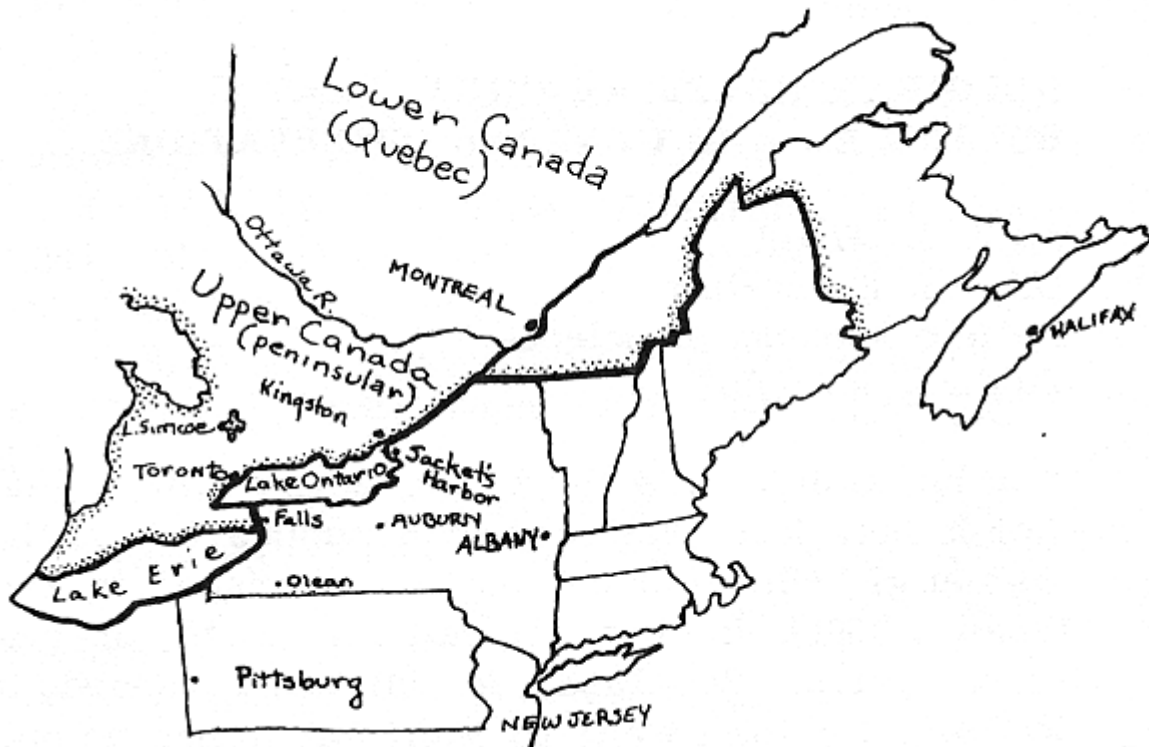
John Goldie described his entire three-year North American itinerary in a publication of the Edinburgh Philosophical Society published in 1822 (Spawn, 1961). He had set sail for North America from Leith, Scotland, in 1817 and landed in Halifax. He then went to Montreal where he met Frederick Pursh (1774-1820), author of the two volume "Flora Americae Septentrionalis" published in 1814, which described botanical materials collected during the Lewis and Clark expedition, and which was the "first complete treatise on the plants of North America north of Mexico" (Humphrey, 1961). Pursh had been suffering from ill health and would die the year after Goldie returned to Scotland. Pursh was living in Montreal and for twelve years had been struggling to finish a flora of Canada, concentrating primarily on what is now the Province of Quebec (Humphrey, 1961). Pursh had earlier taken his North American plant collections to England, where he wrote the manuscript for his 1814 publication. It is likely he had some communication with Sir William J. Hooker, Goldie's mentor at the Glasgow Botanical Gardens, who would himself write another North American flora in 1840 (see part one of this series). This is perhaps why Goldie chose Montreal as his first point of contact - because Pursh worked there. Although Pursh never did complete the Canadian flora, he apparently never lost sight of the importance to science of the Lewis and Clark collections from the western half of the continent for he urged Goldie to connect up with traders leaving Montreal for the north-west in the spring of the next year. This Goldie was never to do, for Pursh, perhaps too ill and perhaps not overly impressed with the young man, did not establish the connections Goldie needed to proceed into the western wilderness. This, Goldie's successor, David Douglas, would later do, with spectacular success (see part one of this series).

It was also perhaps Pursh's 12-year sojourn in Montreal that contributed to intellectual conditions leading to the actual publication of a two-volume flora of Canada in 1862 in French by Abbe L. Provancher, cure de Portneuf, and the rich botanical tradition in Quebec. Pursh, how-ever, "made several important botanical excursions ... on foot and assembled important collec-tions, especially from the Province of Quebec, but all of these were destroyed by fire. As a consequence, nothing was salvaged, and there is no record of the years of labor he had devoted to his Canadian project" (Humphrey, 1961). In the years 1812-1814 the British government had endured a further attempt at territorial expansion on the part of their former North American subjects, who had become independent of British rule during the eighteenth century and had instituted a new nation entitled the United States of America. The northern boundary of this new nation in 1814 was pretty much what it is today, south and east of Lakes Erie and Ontario and their connecting waterways,

and the northern boundaries of the New England states.

British territory north of this boundary was called Canada and was divided into two provinces, Lower and Upper Canada - the generally French settlements in the east, and settlements west of these areas. Botanists and other travelers of the period mention Upper (Canada West, the Upper Province) and Lower Canada (Canada East, the Eastern Province) quite frequently, and it is useful to understand the areas included in these designations. Upper seems to refer to "upriver" in the Great Lakes. By 1855, according to a gazetteer of that year (Thomas and Baldwin, 1855), these names were obsolete. This gazetteer indicated that the boundaries of Canada proper were not fixed in 1855, except on the southern side, and did not really extend west of the prairie sections of the Great Lakes region. Canada's chief mountain chain was the Green Mountains "from the latitude of Quebec terminating between the Bay of Chaleur and Gaspé Point," the Mealy Mountains north of these, and north again to Watch Mountain between the Gulf of St. Lawrence and Hudson's Bay. Far cry from the images of the Canadian Rockies today which dominate our perception of Canadian highlands! Upper and Lower Canada had been separated by the Ottawa River. "Lower Canada, or Canada East, and the peninsular portion of Canada West, is formed by the N. shores of Lakes Erie and Ontario, and the river St. Lawrence, to about long. 70° W., after which the state of Maine and the province of New Brunswick mark its N.E. limit. The W. side, again, comprising Canada West, is formed by the N. shores of Lakes Superior and Huron." The peninsular portion terminated in Lake Erie, the southern boundary 280 miles in length. The eastern province terminated in Cape Gaspe. The peninsular region of Upper Canada was southern Ontario, and included the Niagara peninsula, Toronto, east to Windsor.

In his first year, Goldie walked from Montreal down through New York State to Albany, then on to New York City. He made extensive collections in the pine barrens of eastern New Jersey near Quaker's Bridge, "a country which, though barren and thinly inhabited, yet presents many rarities to the botanist, and gave me more gratification than any part of America that I have seen" (Goldie, 1822, quoted by Spawen, 1961), that is, during his three year stay. Goldie sent all these collections to Scotland, but they never arrived there, much to his disappointment. He scraped together enough money by teaching along the Mohawk River in New York before returning to Montreal where he learned he had failed to procure the patronage of Pursh. The next year, Goldie performed manual labor to support himself and botanized along the Ottawa River. These specimens, sent to Scotland, were lost in the St. Lawrence by the wreck of the ship on which they were deposited. At last, in his third year, having earned and borrowed just enough money to support his own field work, Goldie set off on his last chance to make a success of his trip to North America - the itinerary which he described in his diary of 1819.



Goldie's journal is entitled "Diary of a Journey Through Upper Canada and Some of the New England States." His journey in Upper Canada was along the north shore of Lake Ontario from Montreal down to Niagara Falls and Fort Erie and thereon into the states of New York and Pennsylvania. His diary does not include his visits to the New England states during the first two years of his trip, and the diary title may reflect more ambition than he was able to muster - indeed, he never published it himself, and it had only been printed privately in 1897, then heavily edited of its interesting political and social commentary (Spawn, 1961). It is to Mr. Spawn of Philadelphia, the descendants of John Goldie in Ontario and the trustees of the Toronto Public Library, who own the manuscript, that we owe thanks for having the unexpurgated version privately printed in the 1960's.

Goldie was young and eager to go somewhere, perhaps in the manner of the scholars of the French Academy invited by the brilliant young Napoleon to serve as soldiers of the French army, which was committed to one of the maddest and most successful campaigns: the conquest of ancient Egypt at the threshold of Africa, and the opening of the mysteries of its Mameluke traditions, social, political and natural historical data to an educated and curious Europe in the years just before the turning of the Eighteenth Century. Goldie was even packed and ready for an expedition to the Congo basin but was replaced at the last moment by a man with more influence (Spawn, 1961). He was ready to descend into the wilds of western North America, but was disappointed in this, too. It is almost with relief for his well being that we learn of his decision to explore the relatively civilized areas that constituted his actual exploration. The fabulous, spectacular best-selling diaries and accounts of explorers such as David Burton and H. M. Stanley in darkest Africa, where chilling accounts of barbarous traditions and events of the slave trade, of personal sickness and suffering made them imperative reading in the Victorian age set Goldie's little account in one of the minor classes of the species. Yet it is compelling reading because its author was just as serious, determined, fascinated and objective.

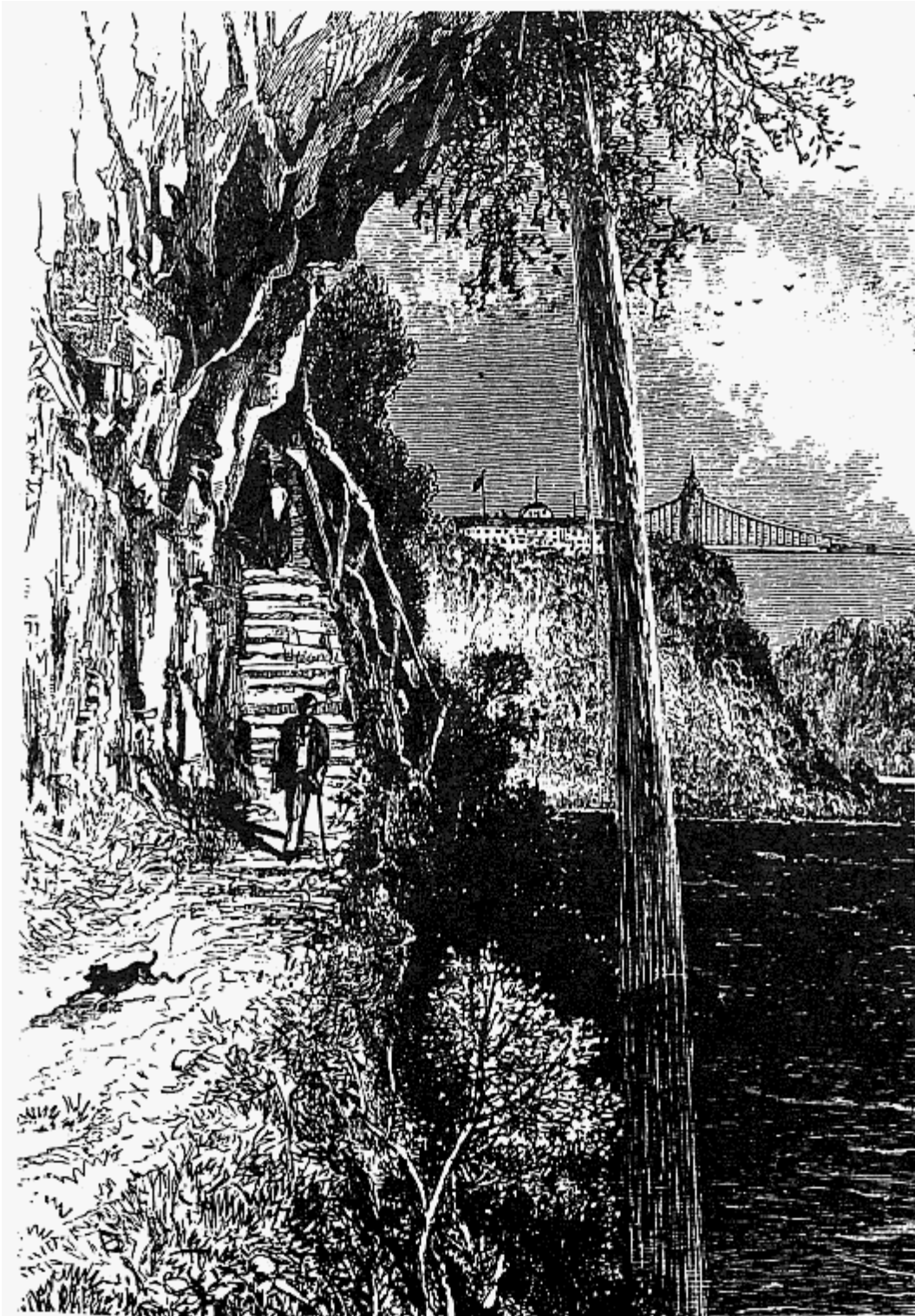
Six days out of Montreal, Goldie did see the spot where the corpse of a victim of a murder was found. No, not the corpse itself, but "part of the cloths still remain in the snow where

he was lying." While the great African explorers described the barbarities which lead outraged Europeans and Americans to bring the African slave trade to an end, Goldie related his dismay at one of the inns near Salina, New York, in which he lodged for the night "to witness the general inattention to even the external duties of the Sabbath, both in the States and in Canada" where the citizenry engaged in "drinking, shooting, fishing, or some such amusement, and that even by many who consider themselves to have good moral characters." Goldie quitted the inn in disgust. How fortunate for the young man that he did not perish on the Congo, as did the man who used his connections to take his place and as did much of the rest of that expedition (Spawn, 1961).

Goldie observed the sands that ringed Lake Ontario and impoverished the crops, being remnants of the old beaches when the Lakes were higher, or outwash and morainal deposits from what we now know to have been glacial melt sediments. Scoured, barren and uneven rocky areas ringed northern Lake Ontario, too, where farms had not been established. He was tormented by mosquitoes and blackflies day and night as he walked on foot, carrying all he owned in a knapsack, and his collections (in a collecting book - insects he kept in his hat) besides. Mosquitoes also bothered Linnaeus' student Peter Kalm (1770), who explored the Niagara area in 1750 and in whose writings they are several times described. So prevalent were they that a traveler's face would become covered with blood from their bites, and one's face a swollen mass, resembling small pox, such that "people are ashamed to appear in public." The land, especially in the glaciated regions, was much wetter than is evident now after centuries of land modifications, stream control, drainage, etc., and these insects have consequently declined, although frequently mentioned in early writings.

Penstemon hirsutus (L.) Willd., which grows all along the dry, windswept crest of the Niagara River gorge today, covered the east bank of a creek thirty miles east of the Toronto area (called by Goldie York). From here he passed through miles of "barren sandy Pine Woods, which it is probable will never be cleared" presumably due to the infertile character of the soil. More sand was observed on the cliffs of Scarborough. After having spent a productive time in the New Jersey pine barrens, Goldie was disappointed at not finding similar rarities in what the local people called the Pine Plains of York. A week was spent collecting in the woods and swamps of Lake Simcoe - still a marvelous botanical area and the type locality for one species at least, *Ranunculus rhomboideus* (Goldie); Goldie in Edinb. phil. jour. 6., p. 329, t.11 f. 1; Hook. fl. Bor.-Am. I, p. 12. The type locality given as "In dry sandy fields, near Lake Simcoe, Upper Canada [Ontario Co., Ontario]" (in Jones and Fuller, 1955). Butterfly Weed (*Asclepias tuberosa*) was found there and a white-flowered *Euphorbia*. Goldie regretted his single week there for he felt new species could be found and described at this locality.

Again, "a Sandy Pine Barren" could be seen for five miles south of Toronto along the lake, so rich in botanical material that he wished "that there were more of the Pine barrens, even than what there are" and that the soils were sandy. Twenty-eight miles south of Toronto, and thirty in direct line, Goldie was met with the "incredulous surprise" of seeing a "great body of smoke on the opposite side of the Lake" - Niagara. Niagara could be heard at the same distance. Goldie now saw *Platanus occidentalis* growing naturally at the northern limit of its range. The soil along the Niagara River from Niagara-on-the-Lake to Queenston was sandy and the roads lined with cherry and peach trees, on the former of which he refreshed himself, as water was very dear.



- Old Path to Horseshoe Falls -

From Queenston, Goldie ascended the escarpment and began his geological and geographic observations, some of which I have described in the first part of this series. The Whirlpool impressed him, and he observed the sheer cliff faces and the forested talus slope of the gorge walls. A 28-step ladder had been placed here from the top of the gorge to the top of the talus slope by which Goldie descended into what might have been Whirlpool Ravine today, where he found "two species of little ferns which I had not hitherto met with," probably Maidenhair Spleenwort (*Asplenium trichomanes*) and Purple Cliff-brake (*Pellaea glabella*) - both conspicuous on the cliff-faces, and the last one in

particular quite rare. He was puzzled that he could just barely make out the sound of the falls, though only a few miles south of it. So typical of the surrounding region were all the approaches to the falls that, according to Goldie, even 200 yards distant from the cataracts, the traveler could not have detected their existence. Goldie came to the cataracts from above the Niagara Moraine above what is now the Queen Victoria Park for "before getting to Table Rock you must descend a pretty steep bank at a little distance." He was astute enough to recognize this lower area was the former bed of the Niagara River. At that time that famous dolomite ledge at the extreme flank of the Horseshoe Falls still touched water. Only seven years later (1826), the eighteen year-old George Clinton would hang "with [his] body partly over Table Rock and [gaze] at the rage and turmoil below" (Zenkert, 1934). The twenty-four year old Goldie was "extremely disappointed with respect to the sound of the falling of so great a body of water ... having read that [at the bottom of the fall] the sound was there far greater than above but still had the mortification to be disappointed." What Goldie had read, had also come to the attention of Linnaeus's student Peter Kalm, who visited the falls in 1750, who noted "several who have spoken of these falls have declared that the roaring noise is so deafening that people ... cannot hear each other speak ... but I did not find it so" (Kalm, 1770).

Goldie observed Goat Island and that "there are 10 more Islands immediately adjoining to it, eight on the American side and two on the Canadian." One quarter-mile downriver [on the Canadian side] another 28-step ladder affixed above to an Arbor Vitae tree had been set into the gorge to the top of the talus slope and he descended to the water's edge. At the bottom of the ladder "Mr. Forsyth who keeps the nearest Inn, has erected a covered stairway by which all who choose may go on paying" a fee. This lower path, obliterated since the turn of this century by power development, was "rather difficult walking ... from the quantity of loose rocks, lying along the water's edge, that have fallen from the bank" and the projecting top strata, of which, for example, Table Rock was composed, crumbled "a very small portion of them having fallen upon me ... would have been a termination of all my labors." Here is described the wonderful sensations and danger attending the opening behind the curtain of water made by the extensive overhang of the upper strata - the precursor of the Caves of the Winds on both shores, and the air "in violent agitation" behind the curtain. It was July 12th and the vegetation on the talus slopes by the water curtain of the Horseshoe Falls presented "a number of plants which I had not hitherto observed, some of them however I had not the pleasure of seeing in blossom." These might several weeks later have proved to have been the lovely autumn flowering Fringed Gentian (*Gentianopsis procera*) and Kalm's Hypericum (*Hypericum kalmianum*) remarked on by other botanists in this place.



CAVE OF THE WINDS.

The bridge to Goat Island had just been constructed in 1818 (in 1817 the first bridge was destroyed by ice) - only one year before Goldie's visit, such that he exclaimed "I had always considered this Island as being inaccessible to man." No bridge had yet been made to Luna or the Three Sisters, according to the map Goldie drew in his diary. Goldie was probably the first botanist to have had opportunity to examine the primitive Goat Island flora. He was lured across the River on the ferryboat and crossed the bridge for 25 cents (children half price). David Douglas would collect on Goat Island four years later (1823) and Asa Gray, newly graduated from college in 1831, would collect botanical rarities at Terrapin Point which he would share with John Torrey and thereby begin a botanical alliance which would establish the science of botany on the American continent.



Even after only one year's accessibility by bridge "there is a good road around the Island, and a considerable portion of the [upriver] end is cleared and at present carries a good crop of corn ... and it contains at present one log house." The family of Peter and Augustus Porter had bought the islands at the brinks of the Falls by 1815. The clearing had been made, for turnips and an unfortunate little herd of goats by a brother of John Stecknan, survivor of the Devil's Hole Massacre of 1763 and licensed operator of the portage on the American side when that was crown territory (Porter, 1900). This log house probably was erected during British territorial possession by the Stedman family, who enjoyed taking their visitors on the harrowing passage to the island over the shoals and shallow areas on the north side of the Niagara River immediately upstream from the rapids. The hut is depicted in Porter's article on the history of Goat Island, was located above a natural spring on Goat Island on the north side and served as a temporary refuge for Francis Abbott, an unhappy young man whom the Porter's permitted to live on their island for a year or so before his death - he was otherwise known as The Hermit of Goat Island.

Goldie passed to Fort Erie, crossing to Black Rock, Buffalo, New York. The road along Lake Erie was built in the native sands there. Goldie noted "a general deficiency in the flax crop in this part of the country" south of Buffalo "owing to want of sufficient moisture." Zenkert (1934) referred to a decline in the occurrence of a flax-parasite, Flax Dodder (*Cuscuta epilinum*) due to the decline of flax cultivation in the Niagara Frontier. In Cattaraugus, Goldie was delighted to find an expanse of swampy ground covered with *Rhododendron maximum* in flower and *Liriodendron tulipifera* with four-foot bases, called, perhaps mistakenly by Goldie, the cucumber tree by the inhabitants due to its fruit resembling a small cucumber (which rather *Magnolia acuminata* does). In the vicinity of Erie, Goldie found a water route, French Creek, from Waterford south to Pittsburgh. He stayed at an inn purporting to have boarded Joseph Bonaparte, "eldest of the Bonapartes," brother to Napoleon, who lived in the United States from 1815 to 1844 (Spawn, 1961). Any reference to trees was to oaks, mostly in a state of regeneration, either from abandoned settlements or from fires. From Pittsburgh Goldie returned north up the AUeghany River to Olean, New York. From Olean to Angelica (32 miles) "the predominating wood is Pine, with a few of the harder woods interspersed." He reached Bath, in Steuben Co., to Penn-Yan, to Salina in the vicinity of which Goldie observed the construction of the Erie Canal, later finished in 1825.

Governor DeWitt Clinton was governor of New York. In Auburn, New York, Goldie saw that the State was building its second prison, the first being in New York City. The

Legislature had, just prior to Goldie's visit, been debating where to put this second prison. When the Porter's first made their bid to buy Goat Island "the Legislature declined to authorize the sale ... stating as its reason that it expected to use the Island itself, erecting thereon in the near future either a State prison or a State arsenal" (Porter, 1900). This is a testament to the natural impregnability and isolation the island enjoyed, and the unusual development and preservation of its ecosystem.

From Sackett's Harbor, Goldie sailed to Kingston for Montreal. Perhaps on his final return to Montreal, Goldie managed to get the roots of the species of fern which bears his name, *Dryopteris goldiana*, later published by Hooker (as *Aspidium*) in Goldie's 1822 paper. The fern was cultivated in Glasgow from these roots. The plants "which I carried with myself" were "the whole that I saved out of the produce of nearly three years spent in botanical researches." "The botanical notes, kept separately from the diary, are believed to have been lost" (Spawn, 1961) - which accounts for why so little of a botanical nature is included in the diary. Another of the plants he collected which became type specimens includes *Helianthus microcephalus* Torr. & Gray (Gray, Fl. N. Am. 2:329 (1842) Type locality: "Thickets and in alluvial soil, upper Canada.' (Goldie, in herb. Hook.) Western Pennsylvania!" The specimens Torrey or Gray saw in Europe, in the Glasgow Botanical Garden herbarium (or Kew) where presumably Goldie's specimens were deposited, reflect the itinerary of Goldie's trip.

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