

## MINUTES OF THE 888TH MEETING OF THE BRODIE CLUB, 19 OCTOBER 1993

**Chair:** Churcher

**Attendance:** Aird, Boissonneau, Bodsworth, Carrick, Churcher, A. & B. Falls, Fowle, Hussell, Lumsden, McNicholl, Reynolds, Riley, Savage, Speakman

**Regrets:** Bendell, Huff

**Guests:** V. Draper, guest of Fowle; J. McAndrews, J. Westgate, J. Cooper, G. Worth, E. & S. DuVernet, guests of Savage

Minutes of the 887th Meeting of the Brodie Club were circulated and adopted as corrected.

### Club business and announcements:

B. Falls noted the Long Point Bird Observatory Meeting on the coming Friday. Suggested by Boissonneau, Speakman will circulate up-to-date members' list, with addresses.

The 1993-94 Brodie Club officer roster was nominated, seconded and approved:

Treasurer:	Speakman
Corresponding Secretary:	Savage
Federation of Ontario Naturalists representative:	N. Martin
Membership Committee:	Carrick, A. Falls, Riley, Young
Program Committee:	Aird, Bendell, Bodsworth, B. Falls, Savage, Huff

The evening's speaker, Walter Tovell, was introduced by Howard Savage, a friend and colleague of many members of the Brodie Club. Tovell, a native Torontonion, trained in geology in California and conducted extensive field studies in Alberta, before settling in Toronto in 1956. He worked at the Royal Ontario Museum, eventually in the position of Director. He is now Curator Emeritus at the R.O.M., and remains an active student of the geology of the Niagara Escarpment. He recently completed the "Guide to the Geology of the Niagara Escarpment", published by the Niagara Escarpment Commission.

Tovell noted with pleasure that copies of his guide, the first geological overview of the Niagara Escarpment area, is now in every school in the planning area, and used by the school boards that use the area for their outdoor education programs. It is helping to explain the significance of the Escarpment, which the Niagara Escarpment Commission is endeavouring to conserve through the land-use planning process, research and education.

Tovell spoke of the early efforts to understand the complex bedrock stratigraphy of the escarpment, noting Lyall's illustrations of Niagara Falls and its gorge in 1850, and their influence on his ground-breaking efforts to date geological processes. Lyall dated the Falls as 30 - 35,000 years ago. Apparently, there was debate at that time as to whether the gorge represented a geological fault, but the erosional origins of the falls and the gorge became accepted as the geological stratigraphy became better documented, for example by J. Hall in 1935.

It was explained to us how the Paleozoic bedrock of the greater Michigan Basin overlays the now-high ground of the underlining Precambrian Algonquin Arch, the bedrock basement of the Gatineau-Algonquin-Ontario Island axis. Bedrock exposures along the escarpment represent a thin slice of the Paleozoic sequence, from the lower clastic shales and sandstones, upsection through the harder carbonate limestones and dolostones. These strata were largely deposited in fluctuating, shallow marine environments about 450 - 415 million years ago. Those deposited over the higher portions of the Algonquin Arch were much thinner, because those areas were periodically exposed above the marine seas, and the Paleozoic materials in those areas, such as Muskoka and Haliburton, have been eroded off the Precambrian basement by repeated glaciation.

The softer clastic rocks at the base of the escarpment were created by erosion of sediment from the adjacent highlands, the ancestral Appalachian Mountains (Taconic Mountains) into the marine environment. Areas close to the Appalachians received the most sediments and, as a result, have the deepest clastic sections. Towards the west, carbonate sedimentation predominated because sources for clastic sediments were minimal.

Tovell illustrated the differences within the upper carbonate strata by contrasting the Silurian reefal formations on the Bruce, such as the Forty Hills (calcium-magnesium carbonates) with the inter-reefal, bedded limestones rich in fossil arthropods used for building stone, such as in the Wiarton area (calcium carbonate). He used some effective illustrations to demonstrate the complex inter-fingering strata that shift their patterns of occurrence from south to north along the escarpment. He pointed out that the rocks of the escarpment are still being studied for evidence of their physical sedimentation and their flora and fauna, and the conventional nomenclature of the stratigraphy is, although well-documented and usable in the field, not universally accepted by all geologists. This is especially the case with regard to the carbonates, which are often difficult to distinguish.

The formation of the escarpment is considered to have been largely through erosion, the removal of relatively soft shales from beneath a more resistance caprock of massive carbonates. The portion overlying the steeper edges of the Algonquin Arch, such as southwest of Collingwood, are most deeply cut while, elsewhere, the escarpment is represented only by a local topographic rise marked by glacial debris. Glacial and postglacial fluvial clearing and modification of promontories, outliers and other irregularities along the escarpment enhanced and defined their size and shape, and cut through and removed debris from re-entrant and outlier valleys.

Tovell stressed the long period of record-less erosion (400 million years), of which we see the remainder, and graphically illustrated some of these erosional processes: the sapping and stream erosion that formed falls, plunge pools and valleys (Niagara Falls); the formation of outliers or salients through erosion, much of it preglacial (Mono Cliffs and the Mono Mills area); the formation of caves and crevices through the slumping of escarpment carbonates as fractures blocks slip off the clastic sub-materials (Singhampton Caves); and the process of chemical weathering, or "denudation", by which there is a gradual lowering of the surface of the land over time.

The escarpment is now clothed in the materials and products of more recent glaciation, and Tovell discussed at some length the interpretation of tills, erratics, drumlins and moraines in the vicinity of the escarpment. By way of example, he discussed the Orangeville Moraine, originally thought to be an interlobate moraine representing the first break between the Wisconsinan icesheets in the Dufferin area. It is a large moraine, with many waterlain flats within it, up to 100 ft thick. It is now thought to be an interlobate kame moraine, greatly modified by waterflow through the area, but not the very first moraine in the area. Tovell showed how C<sup>14</sup> dating has been critical to the correlation of moraines, for example the Horseshoe Moraines around the Ontario Island, and the determination of the recessional (or disintegration) patterns of the ice. As a result, we understand that the Orangeville Moraine is about 15,000 years old and, following a very rapid deglaciation, supported vegetation interpretable through pollen cores (such as McAndrews' core of Edward Lake) by 11,500 ybp. In this area, occupation by humans was as early as 10,500 ybp (Fisher Site, Stayner), at which time trade in "Fossil Hill chert" was already underway.

Tovell illustrated deglaciation by showing summary maps of the pattern of deglaciation of southern Ontario. He spoke about the role of meltwater channels in the drainage of the icesheets, of which the Violet Hill Meltwater Channel is the classic example, draining all the area north to The Pretty River valley southward into the precursors of Lake Erie (the Norfolk Sand Plain delta) and Lake Ontario (Spencer Creek - Dundas Valley), and eventually into the modern Nottawasaga valley after the ice sheet no longer defined its eastward drainage.

Members and guests were particularly interested in the discussion of Mastodon remains from the area. A Mastodon was found in a "waterhole" near Shelburne in 1890, toured around to fairs, and eventually lost. (Another Mastodon, called the S. Thomas Mastodon, was similarly toured and eventually found a home in the North Dakota Natural Heritage Centre in Bismark; the irony of its recent reassembly for display is that Mastodons never occurred in North Dakota in the first place. It was from southern Ontario, and McAndrews successfully identified spruce pollen in sediments attached to the bones, dating them tentatively to close to 10,000 ybp.)

A number of questions followed the talk. Savage noted the lack of archaeological evidence for indigenous occupation of the high ground of the Ontario Island; one possible reason, the historic prevalence of cool, conifer swamp throughout much of it, was cited by Tovell. Riley commented that some recent theories about the processes associated with deglaciation stressed the near-catastrophic role of water, even to the point of theorizing that high-pressure water flow under the icesheets may have been responsible for some of the more striking erosional features, such as at Cabot Head and near Smoky Bluff. Tovell deferred to Westgate, who remarked that such geological theories are problematic after such passage of time, and cited examples of potholes on the prairies to suggest that surface flow events could explain the same features. A number of other queries related to the original extent of Paleozoics in Ontario, such as on the Frontenac Axis, from which they have been eroded primarily by glaciation.

The speaker was thanked by all, to hearty applause.

#### **Members' Notes and Observations:**

Bodsworth noted one of the "strangest incidents in the history of Toronto birding", the Variegated Flycatcher that has been near the Nature School on Toronto Island for 8-9 days. A South American native, apparently of the migrant race, it should be busy migrating from Argentina to Venezuela. It constitutes the 4th record north of South America.

Bill Carrick noted the extensive press coverage of Bill Lishman's ultralight aircraft flight from Blackstock, near Scugog, to Airlie, Virginia, with 18 imprinted Canada Geese in tow, where they will winter at Bill Sladen's research centre. Three planes, 3 boats, a truck, a trailer and motor home are being used by about 2 dozen people. On the morning of the Brodie Club meeting, Lishman has crossed Lake Erie and was explaining himself to Customs officers. The experiment is designed to show the feasibility of training imprinted and captive-bred migratory birds-at-risk, such as Trumpeter Swans, to re-establish flyways and migratory behaviours.

Cooper noted the phenomenon of "duck-napping" in England, where thefts of birds from private breeders, such as a Slimbridge, Gloucester, have raised the problem of how to attach identification "tags" to individual birds.

Fowle noted some striking patterns of Precambrian outcrop in the Bala area, with joint sets fractured into large rectilinear blocks, presumably through ice wedging, the expansion and contraction of ice. He also noted a Kestrel in residence near the Museum preying on Starlings.

Hussell noted that the bird observatory at Thunder Cape has now been operating from May to November this year, and that continued observations at the Cape should be very rewarding. He cited the observations of Dusky Flycatcher and Black-throated Sparrow, distinctly western species.

Falls noted the record of Forked-tail Flycatcher earlier this fall near Cayuga, Ontario, and queried whether the northward records of Flycatchers were part of a pattern.

Boissonneau noted flights of Junco on the 7 - 8 October, and passed on word from Levay at Cranberry Marsh that Black-capped Chickadees had already been seen in large numbers. Male and female Surf Scoter were seen at the "Nonquon Lagoons" at Port Perry, where Boissonneau also noted Pintail, Northern Harrier and a Peregrine that caused a spectacular panic among the geese and ducks.

Speakman reported on a visit to Briar Island, Nova Scotia, where he saw a large number of Sharp-shinned Hawks. Few smaller birds were seen because they were sheltering from the hawks.

**Meeting adjourned 10:25 p.m.**

John Riley  
8 November 1993