Dineen

FRIENDS OF THE PLEISTOCENE

35th Annual Reunion

Ithaca, New York

May 19-21, 1972

Schedule and Guidebook

Arthur L. Bloom, Host Friend

Aided by John H. McAndrews

FRIENDS' REUNIONS

	Year	Place	Leader
1.	1934	Durham, N.H., Hanover, N.H.	J.W.Goldthwait, G.W.White, R.F.Flint
2.	1935	New Haven-Hartford district	R.F.Flint
3.	1936	Rhode Island Shore-Cape Cod	K. Bryan
4.	1937	Hanover-Mt. Washington, N.H.	J.W.Goldthwait,R.P.Goldthwait,R.J.Lougee
5.	1938	Black Rock Forest, N.Y.	C.S.Denny, H.M.Raup
6.	1939	Northern, N.J. (3 drifts)	P. MacClintock
7.	1940	Cape Cod, west end	K.F. Mather, R.P.Goldthwait,L.Thiesmeyer
8.	*1941	Catskills	J.L. Rich
9.	1946	Lowell, Mass. area	L.W.Currier with K. Bryan
10.	1947	Eastern Finger Lakes	E.T. Apfel
11.	1948	Toronto-Barrie, Ontario	A.K.Watt, R.E.Deane, D.F.Putnam, . . . M.W. Tovell
12.	1949	Pensauken formation, N.J.	P.MacClintock,M.Johnson,J.Graham, J.B. Lucke
13.	1950	Ithaca, N.Y.	O.D. VonEngeln
14.	1951	Waldorf, Md.	J.T.Hack, P.MacClintock, coordinator
15.	1952	Columbus-Xenia, Ohio	R.P. Goldthwait
16.	1953	Ayer-Cambridge, Mass.	L.W. Currier, J.H. Hartshorn
17.	1954	Wellsboro, Pa.	C.S. Denny, W.H. Lyford
18.	1955	Malone, N.Y.	P. MacClintock
19.	1956	Drummondville, Quebec	N.R. Gadd
20.	1957	Potsdam, N.Y.	J.N. Harris
21.	1958	Harrisonburg, Va.	J.T. Hack
22.	1959	London, Ontario	A. Dreimanis
23.	1960	Dunkirk, Olean, N.Y.	E. H. Muller
24.	1961	Coastal Maine	A.L. Bloom
25.	1962	Kingston, R.I.	C.A. Kaye, J.P. Schafer
26.	1963	Riviere-du-Loup, Quebec	H.A. Lee
27.	1964	Martha's Vineyard, Mass.	C.A. Kaye
28.	1965	Long Island, N.Y.	J.E. Upson
29.	1966	Chesapeake, Va.	N.K. Coch
30.	1967	Machias, Me.	H.W. Borns, Jr.
31.	1968	Cape Cod, Mass.	C.Koteff, R.N.Oldale, J.H. Hartshorn
32.	1969	Sherbrooke, Quebec	N.R.Gadd, B.C. McDonald
33.	1970	Mt. Washington, N.H.	R.P. Goldthwaite
34.	1971	Glens Falls, N.Y.	G.G. Connally, L.A. Sirkin
35.	1972	Ithaca, N.Y.	A.L. Bloom, J.H. McAndrews

Information from E.H. Muller and R.F. Flint

*1942-45 Inactive during the war

Schedule of the Reunion

Friday, May 19

Gathering of the Friends, Landon Hall, Ithaca College, Ithaca, N.Y.

Saturday, May 20

0700-0800 - Breakfast, Egbert Union Cafeteria, Ithaca College ($1.35)

0800 - Buses depart Landon Hall for west side of Cayuga Lake

1200-1300 - Lunch, Department of Geological Sciences, Kimball Hall, Cornell University

1300 - Buses depart Kimball Hall for lower Fall Creek valley

1700 - Return to Landon Hall

1800 - Cocktails, West Terrace Dining Hall, Ithaca College

1900 - Annual Reunion Banquet, West Terrace Dining Hall

Sunday, May 21

0700-0800 - Breakfast, Egbert Union Cafeteria ($1.35)

0800 - Buses depart Landon Hall for Six-mile Creek and White Church valleys

ca. 1230 - Return to Landon Hall, official end of the Reunion

Itinerary

Saturday morning

(Road log starts at the "octopus" - the convergence of all Ithaca routes at the bridge over the flood relief channel, West State Street. Topographic maps: Ithaca West and Ludlowville 7½'.

Mileage

0.0 Bridge - Ithaca is on a compound delta plain formed by Cayuga Inlet Creek, Fall Creek, Cascadilla Creek, and Sixmile Creek. The latter three drain through steep rock gorges on the east side of the Cayuga trough, and their alluvial fans push Cayuga Inlet to the west side of the valley. This area was largely swamp in pioneer times. Most of the land has been artificially filled, most recently by the dredging of the flood relief channel. Tarr (1904) reported that two boreholes in the middle of the valley encountered rock at 430 ft and 401 ft. Cayuga Lake has a maximum water depth of 434 ft. Bottom-sediment thickness is unknown.

1.3 Taughannock Boulevard (NY Rt. 89) hugs the west trough wall. Bedrock is upper Devonian Ithaca Formation, with typical alternations of shale and siltstone beds, pronounced vertical joints, and a barely detectable southward dip that averages about 50 ft/mi (1%).

5.0 Glenwood overlook. The Fir Tree Point anticline strikes east-west across Seneca and Cayuga Lakes. It is one of the northernmost foreland folds of the Appalachian belt. For the next several miles to the north, the regional dip steepens. The Tully Formation, a massive gray-weathering limestone about 15 feet in thickness at the base of the upper Devonian shales, rises from about sea level under Ithaca to the crest of the anticline, at a maximum altitude of 580 ft. We are traveling on the structural bench of the Tully. A cross section of the anticline can be glimpsed on the eastern lake shore.

5.9 Camp Comstock (Girl Scouts) and Cayuga Preventorium (former tuberculosis fresh-air camp; now day camp).

Many "glens" (ravines) are consequent on the glacially oversteepened wall of the Cayuga trough. Most are on bedrock, but have steep V-shaped valleys cut in colluvium, drift, and weathered rock. A few of the larger streams have exploited the vertical joints to cut small gorges.

7.0 Approximate crest of the Fir Tree Point anticline. The Tully Formation is the caprock for waterfalls below numerous culverts on right edge of the road. All this is well below the 900-ft level of Glacial Lake Newberry, which covered the southern parts of the Cayuga and Seneca valleys.

8.8 Down the dip slope on the north flank of the anticline and onto the delta of Taughannock Creek (Taughannock Falls State Park). Tully Formation is fully exposed in low waterfall on left, here only about 20 ft above lake level. Dip continues down to north, and the Tully is just below lake level at Stop 1.

9.7 STOP 1. "Fernbank" site is on private property, and is landslide-prone. Please minimize digging. We are here by very special permission of the owner.

Fernbank

In 1897 and 1898, a Cornell University geologist, probably R.S. Tarr, collected a molluscan fauna from some lacustrine beds exposed on the western side of Cayuga Lake. The locality for the specimens, now stored in the Cornell Department of Geological Sciences, is labelled "Fernbank", although no local historian has yet recognized that name for a specific locality. The specimens are strongly compressed and flattened, but otherwise in excellent state of preservation.

Later, Carlotta Joaquina Maury and Professor G.D. Harris reexamined the locality. (Dr. Maury subsequently achieved considerable scholarly reputation for her excellent monographs on Caribbean Tertiary molluscs). A brief paper (Maury, 1908, reprinted herein, p. 3, by permission, Univ. of Chicago Press) identified the deposit as interglacial in age, and compared the molluscan fauna with that of the Don Valley beds in Toronto, which were then becoming well known through the work of Coleman. Then, for nearly 60 years, the richly fossiliferous interglacial site laid uninvestigated, on the oversteepened wall of a classic glacial trough, adjacent to a Prestigious University! Even the name "Fernbank" cannot be located in the archives of local history.

In May 1966, (Bloom, 1967), I relocated "Fernbank" or an equivalent site on the lakefront property of Dale R. Corson, now President of Cornell University. To preserve the privacy of the property, no specific directions are given herein. Maury's original location was vague, the site being described as located, "on the western shore of Cayuga Lake.....between Taughannock Falls and Frontenac Beach in a small ravine". The Corson property fits the location reasonably well, and a traverse of the mile of waterfront between Taughannock Falls State Park and the Boy Scout Camp at Frontenac Point failed to reveal any other similar exposures. It is possible that a landslide on the steep lake shore might expose other similar deposits at a later date. The Corson exposure was considerably enlarged by a mudslide in the Spring of 1968, and the lake-front cottage has been endangered by continuing creep and landslides on the weathered shale (Geneseo Shale) cliff behind it. Shell fragments, similar to those washed from the lacustrine interglacial beds, can be seen in the colluvium north of the cottage, about 200 feet north of the main exposure and apparently separated from it by a spur of black shale.

The following species have been identified and are in the geological museum of Cornell University.

Anodonta fragilis Lam. (*marginata* Say)
Anodonta grandis Say
Anodonta grandis var. *footiana* Lea
Lampsilis luteolus Lam.
Lampsilis ventricosus Barnes
Sphaerium simile Say
Pisidium compressum Prime
Pisidium virginicum Bourg.
Limnaea palustris Mull.
Limnaea elodes Say
Physa heterostropha Say
Planorbis bicarinatus Say
Planorbis deflectus Say
Planorbis lentus? Say
Planorbis parvus Say
Amnicola limosa Say
Valvata tricarinata Say
Campeloma decisa Say

Of these species *Sphaerium simile*, *Pisidium compressum*, *Planorbis deflectus*, *Amnicola limosa*, and *Valvata tricarinata* are the commonest forms.

Every one of the species listed has been found, by the writer, now living in Cayuga Lake. But of the five Unionidae, four are Mississippi species which are, however, also living now in the St. Lawrence system. *Anodonta fragilis* is the only one that strictly belongs to the St. Lawrence. *Luteolus* though originally a Mississippi species has secured such a foothold in the St. Lawrence system as to have become one of the commonest shells of the Finger Lakes.

On comparing the Cayuga Valley Pleistocene shells with those of the well-known interglacial beds near Toronto, about 170 miles to the northwest of Ithaca, we find the following species common to both deposits.

Lampsilis luteolus Lam.
Anodonta grandis Say
Sphaerium simile Say
Pisidium compressum Prime
Limnaea elodes Say
Planorbis parvus Say
Planorbis bicarinatus Say
Amnicola limosa Say
Physa heterostropha Say
Valvata tricarinata Say
Campeloma desisa Say

Thus more than half the interglacial species found in Cayuga Valley have also been identified in the warm climate or Don valley beds of the Toronto formation.[1]

But while we find that every one of the interglacial species of Cayuga Valley are now re-established in Cayuga Lake, on the contrary, two-thirds of the Unios in the Don valley beds withdrew permanently from Lake Ontario after the destruction of their colonies. These forms required a milder climate and could only live in Ontario during the warm interglacial period when, as Coleman has shown, the climate of Toronto was so mild as to permit the growth of the paw-paw and the osage orange.

In addition to the similarity of faunas of the Don and Cayuga valley deposits, there is a great similarity of levels. According to Mr. Coleman the lowest of the Don valley beds was formed when the water stood 19 feet above the present level of Lake Ontario. The Cayuga valley deposit began to be formed with the water about twenty feet above the present lake level.

It is unfortunate that the plant remains in the Cayuga valley interglacial bed are too decayed and fragmentary for identification, but the lowest layers of the fossiliferous blue clay, like the lowest of the Don valley beds, are formed of sheets of vegetable matter consisting of twigs, fragments of leaves, and reeds.

In conclusion we may say that (1) the Cayuga interglacial colony was established by Mississippi and St. Lawrence molluscs which came down from the north and west; (2) this would have required a very considerable period of time after their widespread destruction in the preceding ice invasions; (3) the colony could not have been established during a slight oscillation northward of the ice (as might have been the case if the species had come in from the Susquehanna system); (4) more than one-half the molluscs found in the Cayuga valley deposit are reported from the Don valley beds of the Toronto formation; (5) the Cayuga and Don valley fossiliferous beds both began to be formed when the water stood about twenty feet above the present lake levels; (6) it is very probable that the Cayuga fossiliferous deposit corresponds approximately in time with the Don valley, or warm climate beds, of the Toronto Pleistocene formation which is regarded as representing the Peorian, or fourth, interglacial period.

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[1] See A. P. Coleman, *Amer. Geol.*, Vol. XIII (1894), pp. 85–95; *Journ. Geol.*, Vol. IX (1901), pp. 285–310; also C. T. Simpson, *Proc. U. S. Nat. Mus.*, Vol. XVI, pp. 591–95.

FOSSIL POLLEN AND PLANT MACROFOSSILS FROM THE FERNBANK SITE, NEW YORK: an Unpublished Personal Communication

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INTRODUCTION

The Fernbank site was first reported by Maury (1908) who described a molluscan fauna and compared it to the fauna of the Don Beds in Toronto. On this correlation she stated the deposit to be interglacial. Maury also noted the presence of twig and leaf fragments, but she found them too fragmentary for identification. A single pollen analysis by A.A. Berti yielded an assemblage dominated by pollen of deciduous trees such as oak, hickory, beech and elm. This indicated a climate at least as warm as today and further supported an interglacial age for the deposit.

On October 28, 1967, Bloom and McAndrews visited the site and collected 10 samples from the section for further pollen and plant macrofossil analysis. The samples were also given a texture analysis. Fossil plant analysis confirmed the interglacial nature (warm climate) of the lower part of the section but showed that the upper part of the section contained a cold-climate flora.

MATERIALS AND METHODS

The section is located in a bedrock gully about 100 ft. wide. The datum for measuring the section was the surface of Lake Cayuga at 382 ft above sea level. The lower 32 ft of the section was covered with slump. The overlying conglomerate was at about 62 ft. Ten samples, each weighing from 1 to 4 lbs., were collected in plastic bags. The description of the horizons sampled is below. Approximate levels of radiocarbon-dated samples and their ages are also shown.

Sample No.	Approx. alt. above lake	Material
1	62.0 ft	conglomerate; wood in base of conglomerate >50,000 (Y-2431)
2	60.0 ft	sand with wood at conglomerate contact
3	57.5 ft	gravelly sand (4" thick) with wood
4	56.0 ft	medium sand and silty sand with wood
5	53.0 ft	woody fine sand overlying oxidized (orange) sand

Sample No.	Approx. alt. above lake	Material
6	50.0 ft	sandy marl (loose), 2" gray band between orange sand, some modern roots
7	47.0 ft	gray marly sand (orange immediately above); wood >52,000 (Y-1404)
8	42.0 ft.	firm, dark gray, shelly silt
9	35.0 ft	hard, clammy, dark gray shelly silt
10	32.0 ft	as above, but no trash, brownish specks
-	28 ft	wood >54,000 (Y-1403)

Pollen and macrofossil analysis was done on each sample except sample 1, the conglomerate. To concentrate the pollen about 1/2 ml of sediment was treated with standard reagents, i.e. KOH, HF, and acetolysis solution. The concentrate was stained with safranin and mounted in silicone oil. Over 300 pollen grains of woody plants (trees and shrubs) were identified in each sample and this group formed the basic sum. Pollen of herbs and the indeterminable and unknown groups were individually added to the basic sum before their percentages were calculated.

Macrofossil analysis was done on 100 ml of sediment at each level. Concentration of macrofossils was done by washing the matrix through a No. 30 sieve (hole size 595 µ). Identification was done by comparison with herbarium specimens.

RESULTS

The following is the basic sum of woody plants and a list of the numbers of the pollen and spores counted but not included in the pollen diagram. If more than one grain occurred in the count then the number of grains follows the name.

60.0 ft Sum 317, *Populus* 2, *Thalictrum*, Liguliflorae
57.5 ft Sum 317, *Populus* 1, *Liguliflorae*
56.0 ft Sum 322, *Salix* 5, *Corylus*, Ericaceae, *Thalictrum*, Umbelliferae
53.0 ft Sum 308, *Populus* 3, *Salix* 2, Caryophyllaceae, *Isoetes*
50.0 ft Sum 353, *Celtis* 1, *Humulus*, Caryophyllaceae, *Myrica*
47.0 ft Sum 313, *Celtis* 3, *Corylus*
42.0 ft Sum 305, *Corylus*, *Vitis*, *Urtica*, Caryophyllaceae, *Equisetum*
35.0 ft Sum 323, *Corylus* 2, Umbelliferae
32.0 ft Sum 310, *Corylus*, *Vitis*, *Sparganium* type, *Typha latifolia*

The pollen diagram (fig. 1) shows two relatively homogeneous assemblages that are designated zones 1 and 2. The lower assemblage (zone 1) is confined to the calcareous marl and shell-rich sediments. It is dominated by deciduous tree pollen, *Quercus*, *Fagus*, *Carya*, *Ulmus* and *Ostrya/Carpinus* and characterized by small amounts of *Platanus*, *Fraxinus*, *Tilia* and *Acer saccharum*-type. Coniferous-tree pollen is low but there is a small amount of *Pinus* and *Thuja/Juniperus*. Indeterminable pollen is high because of the generally poor preservation of the pollen.

The assemblage of zone 2 is quite different. It is dominated by coniferous tree pollen, *Pinus* and *Picea* with small amounts of *Abies*. The deciduous shrub *Alnus* is higher than in zone 1. Herbs are generally higher than in zone 1, notably Gramineae, Cyperaceae, *Lycopodium* and *Sphagnum*. There are prominent single peaks of Tubuliflorae, *Iva xanthifolia* and Chenopodiineae suggesting that whole anthers were present in the analysis. As in zone 1 the pollen is not well preserved and thus the indeterminable category is high. There is no transition between the assemblages as might be expected if there were continuous sedimentation during the time of plant succession between the vegetation types that produced the two assemblages. Perhaps this succession was not detected because the sampling interval was too coarse or perhaps there was a hiatus in sedimentation.

Despite the pessimism of Maury (1908) the plant macrofossils are relatively well preserved. As with the pollen two distinctive assemblages are present (table 1) and correspond with the pollen zones. Zone 1 has abundant *Thuja* branchlets and the only way I could quantify this was to count each scale needle. Fragments of *Pinus strobus* needles were abundant. Among the shrubs *Vitis* (really a liana) is significant because, to my knowledge, it has never been reported before as a fossil from North America. Among the herbs *Najas flexilis*, a submerged aquatic annual, is confined to this zone.

Zone 2 is distinctive in having abundant *Picea* needles and several *Abies* needles. Relatively small amounts of *Thuja* needles are present but *Pinus* needles are absent. The *Betula* bracts and seeds are difficult to assign to a species but they appear to be of the dwarf birch, *Betula glandulosa*. *Physocarpus* seeds are confined to this zone and they are the first fossil report of this genus in North America. Among the herbs the two *Chenopodium* seeds indicate that this genus was near the site but the seeds are not in the sample that has the Chenopodiineae pollen peak. Similarly, *cf Chrysanthemum* is a member of the Tubuliflorae but the level of the macrofossil does not correspond with the pollen peak.

DISCUSSION

The Fernbank pollen diagram is comparable to the pollen diagram from the Don Bed in Toronto, Ontario (Terasmae 1960). The Don diagram contains two distinctive assemblages, but unlike the Fernbank diagram there is a gradual transition between them. The lower half of the Don diagram is similar to zone 1 except *Fagus* is lower and *Carya* is higher. Also in the Don diagram, *Liquidambar* is present but was not identified in zone 1 of the Fernbank site. Because *Liquidambar* does not occur today in Ontario nor on the Appalachian Plateau of New York but only southward in

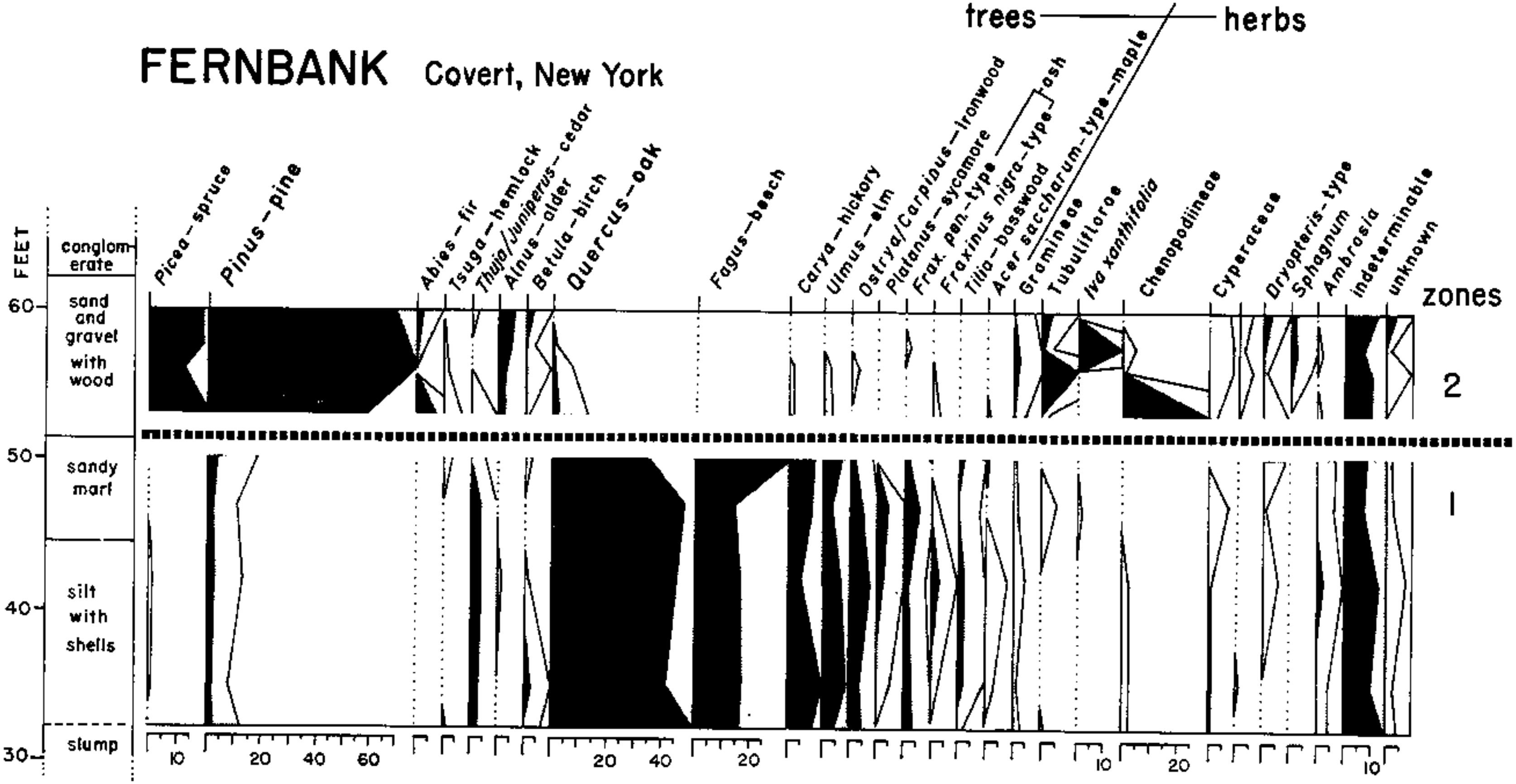

Fig. 1 Percentage pollen diagram of the Fernbank section. The stipple pattern is a 5 X exaggeration.

Zone 1					Zone 2					
10	9	8	7	6	5	4	3	2	← Sample No.	
					1	1			Pinaceae seed	
					4	19	18	3	*Picea* needles	
					1		1		*Abies* needles	
208	1065	4				16	13		*Thuja* needles	Trees
4	203	4							*Pinus strobus* needle fragments	
						3	1		*Betula* bract	
						2		7	*Betula*	
						4		2	*Physocarpus*	
								4	*Rubus*	Shrubs
	1	1					1		*Salix* bud	
		1							*Sambucus pubens*	
	2	1							*Vitis*	
						2			*Chenopodium*	
					1				cf. *Chrysanthemum*	
	1	4				1	1		*Carex* cf. *rostrata*	Herbs
	1	3						1	*Viola*	
246	55	228	13						*Najas flexilis*	
1	2								cf. *Polygonum*	
	2	3						4		Unknown taxa

Table 1. Plant macrofossils (needles, bracts, buds and seeds) per 100 ml sediment.

Pennsylvania, Terasmae (1960) suggested a climate about 5°C warmer than today. If the two sections represent the same warm interglacial, then the presence of this southern species in the vicinity of Toronto and its absence at the same time on the Plateau could perhaps be explained by the climate resulting from the difference in elevation of the two sites. That the climate was warmer than today at Fernbank is indicated by the virtual absence of Tsuga from zone 1 in contrast to the late postglacial where this cool-climate species is well represented in pollen diagrams (Miller 1969). The closest comparable assemblage for zone 1 is the postglacial of central Ohio (Ogden 1966).

Zone 2 is similar to the upper third of the Don diagram and the diagram from the overlying Scarborough bed. Zone 2 is also similar to the diagram from Otto, New York, (Muller 1964) except that Cyperaceae is much higher at Otto. Species of this family are mostly aquatic, and the high percentages may reflect local abundance at Otto. The Otto section has a radiocarbon date of 63,900 ± 1700 years (GRN-3213). Zone 2 is also similar to the dated diagrams at St. Pierre (65,300 ± 1,400 GRN-1799) and Pierreville (67,000 ± 1,000 GRO-1711) in Quebec. The younger mid-Wisconsin assemblages described by Berti (1971) are almost all similar. They suggest tundra and boreal woodland environment.

CONCLUSIONS

The Fernbank section contains sediments of both interglacial and glacial age. The interglacial was warmer than the present climate of the surrounding Appalachian Plateau, perhaps something similar to central Ohio. The interglacial fossils are similar to but not identical with the fossils of the Don Formation which has been assigned to the Sangamon Interglacial. The upper part of Fernbank represents a glacial interval, and the fossils are quite similar to radiocarbon dated sections of both early and mid-Wisconsin age. The interglacial and glacial intervals may or may not be separated by a hiatus in sedimentation.

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End of McAndrews References.

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Discussion topics concerning the Fernbank site

1. Age of the deposits
   - a. Presumed Sangamon and Early Wisconsin, but no direct proof.
   - b. Invertebrate fauna and flora (pollen and macroflora) correlate with Don and Scarborough Formations of Toronto.

2. Climatic implications
   - a. Zone 1 was as warm and continental as central Ohio.
   - b. Zone 2 was boreal. Terasmae suggested a 15°C temperature drop for the similar change at Toronto.

3. Lithologic interpretations
   - a. Were clam-bearing beds of pollen zone 1 deposited in water of constant depth by lateral progradation of a delta, or in steadily deepening water by vertical accretion? Note the "tough", over-consolidated nature of the marly sand, and the abundant flattened wood and clam shells.
   - b. What is the origin of the diamicton exposed in 1972 at the base of the section? Maury (1908, p. 565) called it "bowlder clay". It contains large limestone clasts, probably from the Tully Formation.
   - c. What is the origin of the conglomerate that overlies pollen zone 2? It has about 10% erratic pebbles of crystallines, quartzites, and chert, but no limestone. It is composed primarily of slabs of Geneseo Shale, the local bedrock. Good exposures in 1972 show the sharp boundary between 15 and 20 ft. of oxidized conglomerate over unoxidized blue-gray conglomerate with wood-bearing sand lenses. Is the conglomerate the topset unit of a delta; a weathered, compressed, shale-rich till; a solifluction deposit; or ------?

4. Effectiveness of Wisconsin-age glacial erosion.
   - a. How can such a deposit be preserved at a completely exposed location on the wall of a glacial trough? All wood and shells are compressed in the horizontal plane, suggesting static

vertical stress rather than shearing stress by moving ice. Bedrock configuration is unknown, but the Fernbank site must be a filled valley in the trough wall, or it could not have been preserved. An earlier glaciation is required to erode the Cayuga trough and provide the erratics for the basal diamicton. Interglacial (Sangamon?) time must then include both lateral valley cutting by a rejuvenated tributary stream, and subsequent aggradation or progradation to a lake level at least 60 ft higher than present, during interglacial and again in early glacial time. What barrier held Cayuga Lake so high? How much trough erosion was accomplished by Wisconsin glaciation?

5. A trial balloon, for Friends only.

The thinnest possible slicing with Ockham's razor permits the following hypothesis:

a. Illinoian Glaciation eroded the Cayuga trough at least as deep as present lake level. Some Illinoian till was deposited on the trough wall.
b. An Early Sangamon rejuvenated tributary stream cut a lateral valley here, leaving a bit of Illinoian till at the base of the section.
c. As post-Illinoian crustal rebound continued well into the middle of Sangamon time, a lake in Cayuga trough gradually deepened. The lateral valley was aggraded with marly, shell-bearing lacustrine silt and sand.
d. In Early Wisconsin time, advancing ice north of Lake Ontario and the St. Lawrence River caused isostatic depression of a northward outlet that lowered the local lake level. The top of pollen zone 1 was eroded.
e. As Early Wisconsin ice came nearer, the lake was impounded by an ice dam and rose above the interglacial level. Now, pine and spruce were the dominant flora. Later periglacial solifluction choked the valley with frost-wedged shale fragments.
f. The site was overridden, strongly compressed, but not eroded away during the Wisconsin Glaciation. Deglaciation produced only a negligible veneer of drift.
g. As rebound continues in postglacial time, Cayuga Lake will gradually rise over this site again.

6. A broad-terrain hypothesis, expanding on the above.

Perhaps residual isostatic uplift at Kingston, Ontario in mid-Sangamon time flooded Lake Ontario into the Cayuga basin. Similarities of Molluscan faunas and climates at Toronto and Ithaca would thus be happily explained. Karrow (1969, p. 9) reported that the Don Formation is as much as 100 ft above Lake Ontario. If Kingston were to rise 200 feet relative to Ithaca, to flood the Fernbank site, isobases can be drawn (fig. 2) with a southerly slope of 1.6 ft/mi so that Toronto would be flooded to the top of the Scarborough Formation. Karrow also speculated (1969, p. 11) that the overlying Scarborough Formation, 150 ft above Lake Ontario, is a delta built into an ice-dammed lake that overflowed past Rome, New York. The upper units of the Fernbank site could fit that speculation, too. The major objection to this broad-terrain hypothesis is the very slow isostatic recovery that is implied. The total postglacial tilting in the Cayuga basin is only about 2 ft/mi.

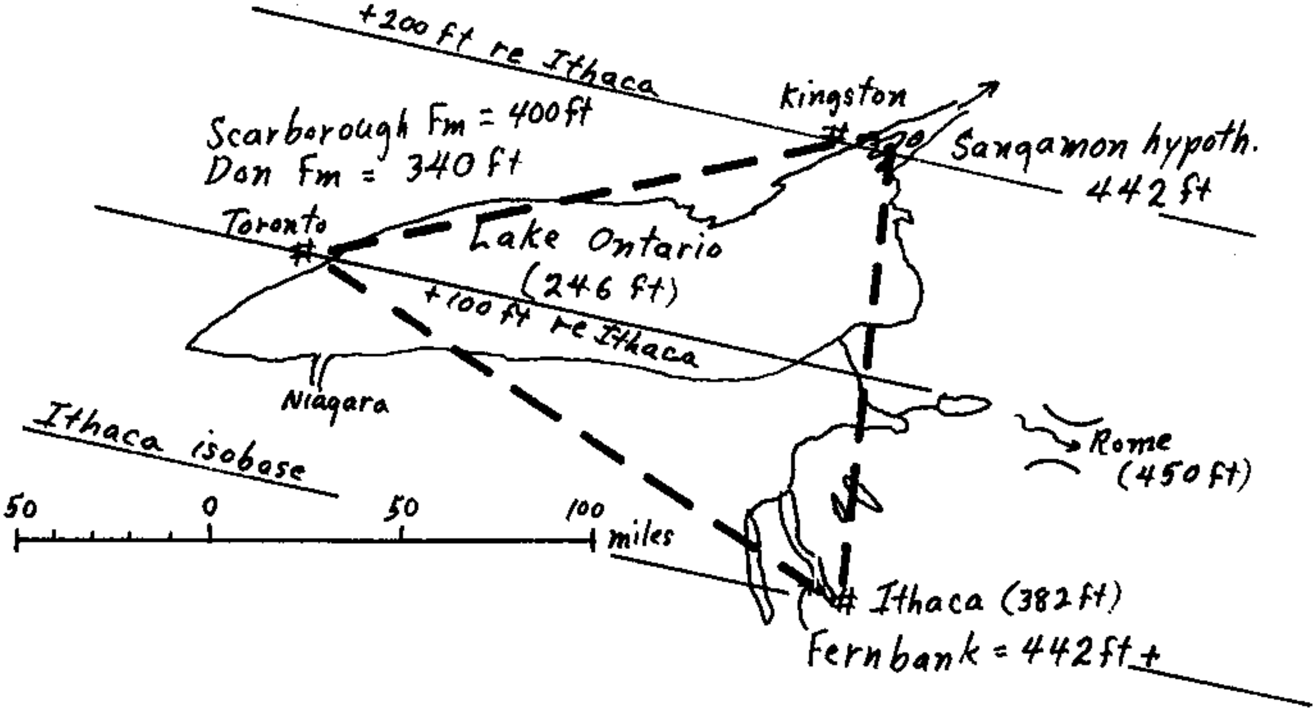

Figure 2. A broad-terrain hypothesis for isostatic uplift as the control for pre-Wisconsin lake levels, Ontario basin.

<u>END OF STOP 1</u>

Return to buses, continue northwest on NY Route 89 to..........

10.3 Left turn on Savercool Road, continue south on Cayuga View Road. Note general lack of view over lake, due to sharply convex trough walls.

11.2 Left turn on Falls Road.

11.8 Left turn on Taughannock Park Road. Abandoned railroad embankment on left. Taughannock Creek here has only slightly eroded into the heavily jointed shale of the Ithaca Formation. Below the former railroad bridge, deeper intrenchment begins.

12.4 STOP 2 Falls Overlook

One of the highest waterfalls in eastern North America, exceeded only by Churchill Falls, Labrador (245 ft), Montmorency Falls, Quebec (274 ft), and Fall Creek Falls, Tenn. (256 ft). Enormous gorge sharply contrasts with the minor ravines consequent on the trough wall.

The great size suggests that Taughannock Creek has reexcavated a filled interglacial valley. Perhaps several cycles of rejuvenation are involved. The plunge pool and broad alcove below the falls may be postglacial. The delta in Cayuga Lake is big enough to refill the full volume of the gorge below Taughannock Falls.

Return to buses. Good views of Cayuga Lake as we continue downhill to main park area, turn right on NY Rt. 89 and return to Ithaca and the Cornell Campus for lunch. Benches on the upper trough wall are hanging deltas of the high-level glacial lakes of late Wisconsin age.

25.0 Kimball Hall, Department of Geological Sciences, Cornell University.

LUNCH STOP.

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Saturday afternoon

(Road log starts at Engineering College parking lot, Cornell University). Topographic map: Ithaca East $7\frac{1}{2}$'.

00.0 Turn right onto Central Avenue, turn right onto Campus Road, continue right at campus guardhouse, and straight ahead onto Dryden Road (NY Rt. 366) at stop light.

2.2 Escarpment face of Mt. Pleasant cuesta straight ahead. Dip slope to the right (south).

2.6 Village of Varna, on meander terraces of Fall Creek.

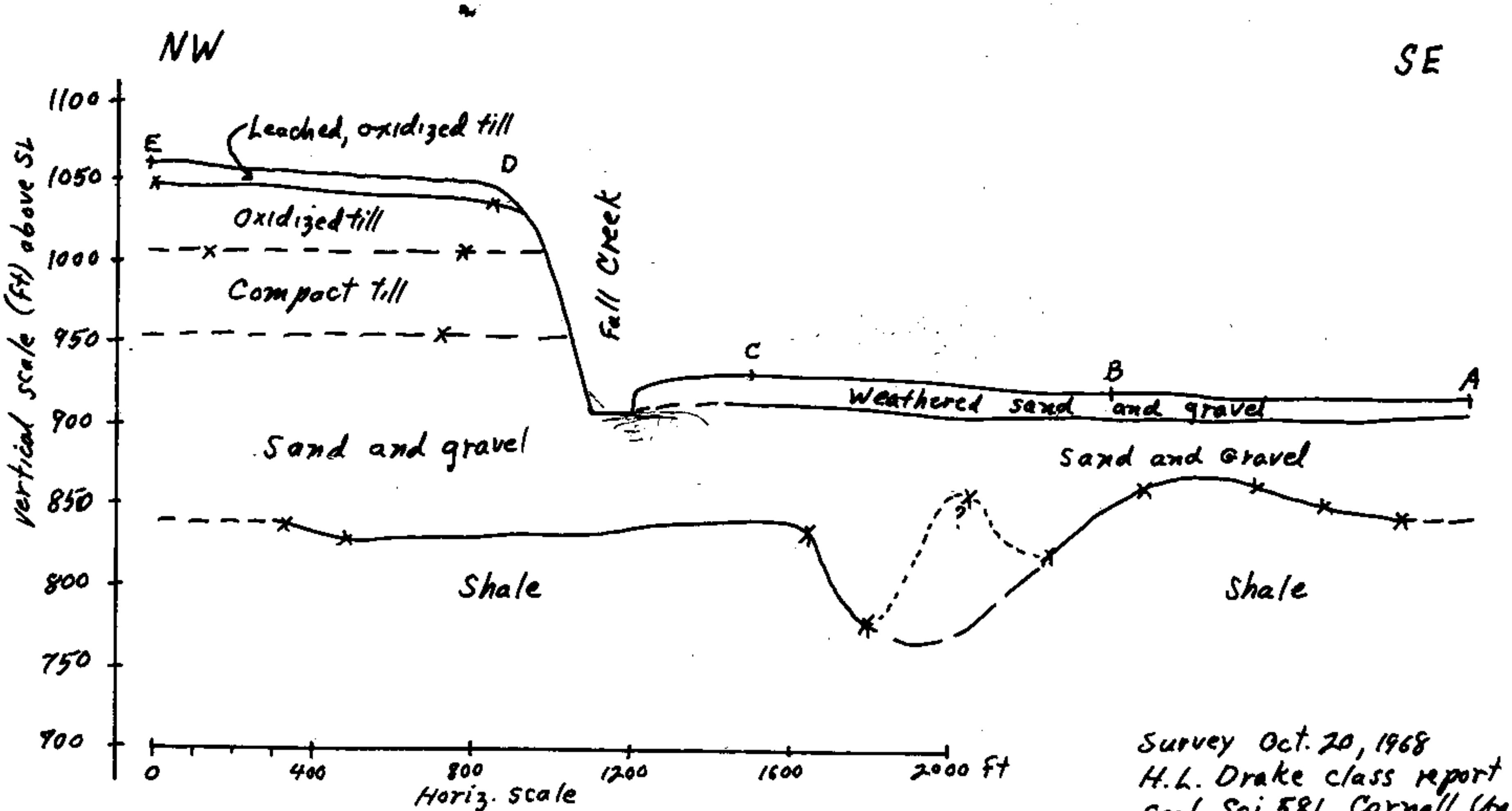
3.2 Turn left, down service roads and across terraces of Fall Creek to northwest edge of Cornell Plant Breeding experimental farm (Tailby Farm). Refer to Cline and Bloom (1965, p. 4-7) for background. The area is shown on plate A-2, p. 27 of the soil report.

3.8 STOP 3. Varna high bank.

(Refer to Cline and Bloom, 1965, p. 4,6). Most of the valley fill is water-laid, but is capped by till. Wisconsin glaciation did not gouge the valley of Fall Creek; rather, it buried it. In 1968, a class project in exploration seismology under Dr. K.F. Clark, assisted by Mr. Curtis Tuttle, USGS Boston, produced a seismic refraction profile of Fall Creek Valley in this area (fig. 3). The survey suggests that the buried valley of Fall Creek is at least twice as wide and twice as deep as the postglacial valley.

While at Stop 3, the late glacial history of the Ithaca region will be outlined with the aid of map overlays. Also, some comments will be made on the age and profiles of the terrace soils.

Return to buses, back across terraces to NY Rt. 366, and return west through downtown Varna to NY Rt. 392.



Calculated interface depths indicated by ✕
vert exagg X4

Survey Oct. 20, 1968
H.L. Drake class report
Geol. Sci 581, Cornell Univ.
copied by A.L. Bloom
May 1972

Figure 3. Seismic refraction survey of Fall Creek valley near Varna, New York

5.0 Turn right on NY Rt. 392, Forest Home Drive.

5.6 STOP 4. "Flat Rock". A favorite swimming hole for the natives. Only moderately polluted. Cornell water supply intake is at the weir just upstream.

This is the first bedrock exposed in Fall Creek below the small upland tributaries. Ithaca Formation dips gently south, causing Fall Creek to migrate laterally against its left bank. Regionally, Fall Creek is a subsequent stream flowing west on erodible shale at the base of Mount Pleasant, which is a cuesta capped by flaggy sandstones of the Enfield Formation (now classified as part of the West Falls Group). Mount Pleasant is a segment of the "Portage Escarpment" of the older literature. This persistant topographic element trends southwest across New York, Pennsylvania, and Ohio, supported by progressively younger late Paleozoic sandstones. It is best viewed in profile from Ithaca College. Fall Creek valley is well adjusted to structure, and the large size of the buried valley suggests a long preglacial and interglacial interval of homoclinal shifting. The valley fill may be of more than one glacial age. At Flat Rock, the river is superposed across a rock spur, which forms the local base level for the reexcavated valley upstream.

Return to buses. The gardens across the road are on a low meander terrace of Fall Creek. Note the oxbow swamp at the back edge of the terrace. A higher meander scar, with more subdued morphology, lies immediately above the gardens. Our route takes us onto the higher terrace on Plantations Road, then west to a lower meander terrace and across Caldwell Road.

6.4 Cross Caldwell Road and continue on Plantations Road to Judd Falls Road.

6.7 "The jughandle". Turn right on Judd Falls Road. Plantations Road continues through the tunnel and along vonEngeln's "Forest Home runaround", an abandoned meander with a central knoll or <u>Umlaufberg</u> (vonE. loved such words!). Continue through hamlet of Forest Home to end of Judd Falls Road, then left on Forest Home Drive. Park at wide shoulder, opposite McIntyre Place.

7.2 STOP 5. Beebe Lake. Walk east to the stone bridge at the head of the lake, where Fall Creek emerges from a superposed bedrock gorge into a reexcavated segment of the interglacial valley, now dammed to form Beebe Lake.

Continue west on Forest Home Drive to Triphammer Bridge. Triphammer Falls on the right. Straight on University Avenue to Sibley Hall parking lot. Walk across University Avenue and down footpath to.......

7.8 STOP 6. Suspension Bridge. Fall Creek is deeply intrenched here in its postglacial gorge on the oversteepened wall of the Cayuga trough.

Continue west on University Avenue, Stewart Avenue, Willard Way and University Avenue, then turn right on Lake Street down "Gunshop Hill" past Ithaca Gun Company for a bus window look at Ithaca Falls, where Fall Creek emerges from its gorge onto the delta plain.

8.9 Turn left into Ithaca High School parking lot. If time permits, a photo stop for Ithaca Falls. Then return to Lake Street over Fall Creek, turn right on Fall Street for one block, then left on Aurora Street and return to Ithaca College.

11.8 Landon Hall parking lot. End of Saturday trip.

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Sunday morning

(Road log starts from the Coddington Road entrance to Ithaca College). Topographic Maps: Ithaca East and Willseyville $7\frac{1}{2}$'.

00.0 Southeast on Coddington Road. Ithaca College is on a rock-floored meltwater channel that spilled from Inlet Valley to the southwest across south hill and into Sixmile Creek valley. The channel crosses the college campus at 1040 ft , then slopes southeast along the hillside at 25 ft/mi for about 2 miles along Coddington Road, until it disappears beneath the lacustrine sediments of Glacial Lake Ithaca at the 980 ft contour. Note the increase in contour crenulation on the Ithaca East topographic map below this level.

2.0 Burns Road. Turn left and downhill across gullied bedrock and pink lacustrine sediments.

2.8 STOP 1. Ithaca water supply settling basin. Walk 0.5 mi upstream on north bank, past the large landslides on the south bank that were the major objectives of the 1950 Friends' Reunion. The slide area is overgrown and obscurred now, but Victor Schmidt's description of the section from the 1950 Reunion guidebook is included here. If time and volunteer creek-waders permit, samples of varves from the slide area will be examined.

Along the north bank of the creek a diamicton is exposed. It has a compact, non-calcareous, green-gray clay matrix, with heavily oxidized joints. Crystalline pebbles are rotted. About 10% of the pebbles are exotic crystallines, quartzites, and chert. Clasts are well rounded and show no typical till-stone facets or striations. angularity of chert

Hypothesis: This is Illinoian outwash, leached of an original 15%-25% carbonate content, and thereby enriched in silt and clay from the insoluble residues of the weathered carbonates.

At the upstream end of the exposure, the diamicton dips east under a lens of sheared, thrusted, non-calcareous varved silt and clay. Matted organic debris from the basal contact of the varves is >39,900 years old (I-6046). No great surprise, for the site is stratigraphically lower than the base of Schmidt's varves, from which a finite radiocarbon date of 41,900 ± 900 (Y-1401) was obtained on a driftwood knot of spruce in lacustrine sand at an altitude of 800 ft. An earlier attempt to date the varved sequence gave an infinite age of >35,000 BP. (W-504).

Friends of the Pleistocene 1950 Meeting

VARVES AND RELATED DEPOSITS EXPOSED IN THE HIGH BANK ABOVE THE SILT BASIN ON SIX MILE CREEK NEAR ITHACA, N.Y.

V. E. Schmidt*

? ' TILL. In former years slides exposed 8' sorted sand and 5' weathered unvarved lake clay at top of bank, probably higher than till. Nature and relations of these deposits not clear.

40' VARVED SILT AND CLAY; 4th series. Approx. 500 varves; show 500 considerable variation in thickness, structure, color. Varves in several zones consist of thick layers of fine red clay and thin layers of gray silt, similar to some in 3rd series. In upper part of series are about 150 well developed varves with sharply demarcated summer and winter fractions; these varves decrease in thickness upward. Above them are 6' of much slidden varved clay.

1' GRAY SAND, with some gravel. Contains fir wood and mosses. Color due to ferrous sulfide; turns brown upon exposure. Cross bedding indicates current from E or SE. Clay balls in sand derived by erosion of underlying clay; are dry inside although sand is wet.

6' VARVED SILT AND CLAY; 3rd series. Approx. 100 varves. Some 600 consist of thick layers of fine red clay and thin layers of gray silt marked with trails of small aquatic animals. Silt layers in these varves probably deposited by ancestral Sixmile Creek in spring; true summer component comprises greater portion of red clay layer; winter component consists of sharply demarcated uppermost portion of red clay which is finer and darker than that below. Source of clay probably red shales which outcrop some 45 and more miles to the north.

4' GRAVEL, cemented and stained by limonite. Deposited by ancestral Sixmile Creek. 690

6' VARVED SILT AND CLAY; 2nd series. Approx. 90 varves. Cross-bedding in silt indicates current from E or SE.

5' GRAVEL, cemented and stained by limonite. Deposited by ancestral Sixmile Creek. 1020

0-2' VARVED SILT AND CLAY; 1st series. Up to approx. 100 varves here; more than 330 upstream where this series occurs under and along creek for 1/4 mile and attains thickness of 13'. Lowest varves thin; thickness increases upward, chiefly by increase in winter-layer thickness. Strikingly high proportion of ice-rafted Medina sandstone pebbles in clay. Elevation of series approx. 720'. Varves overlain by till 1/4 mile upstream. Varves probably deposited during ice advance, in Lake similar to Lake Vanuxem or Lake Warren.

3" PLANT REMAINS in silt and sand. Matted mosses, small leaves, rootlets, twigs, occasional beetle elytra. Probably a soil. In places is overlain by thin layer of sand and gravel, possibly a shore deposit.

16' TILL. Majority of pebbles rounded; probably glacially reworked stream gravel. Contains zones of what appears to be glacially reworked lake clay.

*Reference: Schmidt, V.E., 1947, Varves in the Finger Lakes Region of New York State: Cornell University Ph.D. thesis, unpublished.

This site is another example of the amount of old drift that was overridden by the Wisconsin ice sheet, but not removed from the valleys around Ithaca. If the Wisconsin glacier was so incompetent, when were the great troughs eroded?

The infinite and finite radiocarbon dates suggest that by > 40,000 years ago, an ice wall at least 500 ft. high closed the north end of the Cayuga trough, and backed water into this valley to an altitude of more than 800 ft. Schmidt's varves show summer silt layers derived from the local gray siltstone and shale terrane, and winter clay layers derived from the red Silurian shales at the north end of Cayuga Lake. Varve thickness increases upward, primarily by an increase in thickness of the red winter layer, suggesting that the lake was growing deeper and the ice margin was approaching. The top of the section is reportedly overlain by till, presumably of Wisconsin age.

End of Sunday Stop 1.

Backtrack south on Burns Road to Coddington Road, turn left (southeast) and continue to Middaugh Road.

8.1 Turn left on Middaugh Road, then right on gravel road toward Brooktondale. Road is on flat top of the Brooktondale delta, a deposit of unclear origin and stratigraphic position.

8.8 STOP 2. Brooktondale delta. Surface elevation is at 1020 ft , but the through valley to the south is at 980 ft. Obviously, this delta built westward into a lake, but what sealed the large, open valley to the south to hold up the lake? vonEngeln (1961, p. 91) appealed to residual ice blocks. I have collected striated, faceted cobbles from the topmost sediments of this delta (now stripped back for gravel removal), and propose that this entire mass was implaced prior to the last ice advance. If so, it would correlate with Schmidt's varves at the previous stop. I can't prove that relationship in 1972, though.

Continue to Perkins Road, on the floor of Highway Materials Co. gravel pit.

8.9 Turn right on Perkins Road, along the floor of the meltwater channel of Glacial Lake Ithaca (980 ft.).

9.3 Turn left on Caroline Depot Road, across the floor of the overflow channel and onto the east side of the Brooktondale delta.

9.4 Turn right on White Church Road, on a kame terrace. Dead ice at the level of this kame terrace would have held water deep enough for the Brooktondale delta. The valley floor is the younger meltwater channel.

10.4 Turn right on Belle School Road

10.8 STOP 3. Drainage divide of the Susquehanna and St. Lawrence Rivers, in a swamp just below 980 ft. This is the White Church outlet that controlled the level of Glacial Lake Ithaca. The meltwater eroded a channel across the Brooktondale delta and across the Valley Heads moraine a few miles south, but this is the threshold, and is presumably floored by rock. The White Church valley may be the type "through valley". The landform was described by Tarr (1905, p. 233), but named by W.M. Davis in his discussion of Tarr's paper.

11.2 Left on Coddington Road, into Susquehanna headwaters. Note oversteepened, ice-shorn valley wall ahead. Road is on kame terrace matching the one on the opposite valley wall.

13.4 Kame terrace becomes more hummocky as we approach the proximal face of the Valley Heads Moraine.

14.0 to 14.4 Valley Heads Moraine. Note ice-contact slopes, kettles and kames. Meltwater channel on the left has eroded the eastern half of the moraine. Last large kettle behind a mobile home on the right, than a few more shallow kettles, then up the ice-contact face and onto valley train of cobble gravel. The few shallow pits may be kettles.

Continue for about 2 mi. to village of Willseyville, then turn right onto NY Rt. 96B and return to Ithaca College via Danby. A small Valley Heads moraine impounds a swamp halfway up Danby Creek. The divide is at the north end of this valley, near Danby, but the valley form is similar to a through valley.

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References cited by Bloom (see McAndrew's unpublished communication for additional references on the Fernbank site).

Cline, M.G., and Bloom, A.L., 1965, Soil survey of Cornell University property and adjacent areas: Cornell Miscell. Bull. 68, New York State College of Agriculture, Ithaca, N.Y., 31 p.

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