DEGLACIATION OF THE EASTERN FINGER LAKES REGION

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Regional Setting

The field trip area is located in central New York State and comprises parts of the Tully, Otisco Valley, Truxton, Homer, Sempronius, and Cortland 7½ minute U.S.G.S. topographic quadrangles. This region consists predominately of gently southward dipping Devonian shales with an east-west system of broad anticlines and synclines (Tarr, 1909).

There is wide disagreement in the literature concerning residuals from preglacial erosion.

Durham (1954) described three erosion surfaces in the surrounding region, the highest or Schooley Peneplain at 1600 to 1999 feet, the next between 1500 and 1700 feet, and the lowest between 1100 and 1300 feet. He further considers only the Schooley Peneplain to be a true peneplain and the others to be the result of structural control by resistant strata.

Denny (1956) concluded that remnants of former peneplanation have been reduced.

Muller (1965) stated that summit accordance is valid only if summit reduction by glaciation is light and that "... summit contours generalized to a six mile grid give an impression of imperfect summit accordance." (1966)

Clayton (1965) stated: "... the whole of the relief near the Finger Lakes is the work of ice, and is quite independent of the form of the preglacial landscape. The destruction of that earlier landscape is almost complete, ..."

The present form of the topography is probably the result of multiple cycles of glaciations and interglacials (Coates, 1966) with erosion by late Wisconsinan glaciation contributing little to the present bedrock form of the topography.

Through Valleys

The first reference to through valleys was by William Morris Davis as reported by Tarr (1905): "One of the most striking features in the topography of the divide region between the Saint Lawrence and Susquehanna drainage is the marked absence of well defined divides between the larger streams which head in this region. Along a number of valleys it is possible to pass from one drainage system to the other through open valley in which the present divides are determined not by rock but by drift deposits. A similar condition is found between the headwaters of the larger tributaries on each side of the main divide; and even in the case of the smaller tributaries there is frequently a condition of lowered divides. ... Professor Davis applied the very descriptive name of "through valleys" to this condition of valleys connected across lowered divides."

The through valleys, such as the Tully Valley, were probably formed along north-south lines of preglacial drainage. Coates (1966) suggests a multicyclic theory for the origin of the through valleys: These "... drainage anomalies represent the combination of a long period of preglacial erosion followed by a series of unusual glacial, interglacial, and proglacial stream diversion channels that were repeatedly exploited by later ice movements." It was this exploitation of channels by the ice that scoured out the through valleys and created their characteristic U-shaped channels.

The Tully Valley extends south from Onondaga Reservation and is joined by Otisco Valley just south of Preble. The valley ends south of Cortland in an outwash plain. Von Engeln (1921) attributed 600 feet of erosion in the Tully Valley to glaciation and suggests an additional 100 feet now filled by drift.

A profile (Fig. 2) from seismic data of Durham (1954) and Faltyn (1957) indicates approximately 200 feet of fill south of the Tully Moraine, 800 feet at the moraine and about 600 feet to the north.

Wisconsinan Glaciation
Olean-Binghamton

The substages of Wisconsinan glaciation in the central New York region have been the subject of much controversy. MacClintock and Apfel (1944) subdivided till sheets south of the Finger Lakes region into Olean and Binghamton Substages on the basis of lithology. They concluded that the earlier Olean ice moved southwest whereas the Binghamton ice moved south.

Moss and Ritter (1962) divided the drift of central New York into the Olean Substage and the Valley Heads Substage on the basis of constructional topography, heavy minerals, pebble lithology, texture, and till pebble orientation. They recognized in the Olean till areas, drift resembling the exotic rich Binghamton drift of MacClintock and Apfel (1944) and termed it as "Binghamton type drift". They found no evidence to support the claim of a separate advance during "Binghamton time" in central New York.

Muller (1965) accounts the difference between the lime-deficient upland or Olean till and the exotic-rich lowland or Binghamton-type till in the following manner: "... regional dip is gently southward, outcrop belts swing abruptly toward the plateau where they cross major through valleys. The result is significantly shorter transport for exotic constituents derived from through-valley exposures than for those from exposures at the north margin of adjacent upland. Channeling of basal ice-flow by underlying topography presumably served to intensify southward transport in through valleys, whereas ice overriding the uplands was both relieved of exotic load by shearing over stagnant basal ice and given fresh debris derived from scour of exposed upland surfaces."

Valley Heads

The term Valley Heads was first used by Fairchild (1932) to describe thick plugs of drift in the southern end of the Finger Lake valleys. The moraine occurs in all major valleys but is sporadic and in many areas untraceable on the uplands.

According to Holmes (1952) the Valley Heads (Ontarian) glacier formed in the deepest part of the Ontario Basin whereas Connally (1960) places the source of the ice in the Grenville meta-sediments northeast of Lake Ontario. The glacier spread outward from the northwest (Fig. 5). Radiocarbon dates (Muller, 1965) indicate that Valley Heads recession occurred more than 12,000 years B.P.

The terminus of Valley Heads glaciation in the Tully Valley is located just south of Song Lake (Fig. 1) in what Muller (1966) referred to as an advance Valley Heads position. Subsequent heavy mineral studies by Kirkland (1968) confirm this location. This advancal position represents a minor oscillation of Valley Heads ice with the major location of the active ice front at the Tully Moraine. Equivalents of the Tully Valley advancal position, although not as pronounced, are present in other through valleys.

The occurrence of stagnant ice features such as the Tully kettle lakes indicates a short length of time for outwash deposition south of the Tully Moraine, because during a longer period the ice would have melted and the subsequent kettles would have been filled by the outwash.

Valley Heads ice did not cover the hills northwest of the Tully Moraine as indicated by north-south striae on Vesper Hill (Kirkland, 1968) and north-south till fabric (Holmes, 1939) on the north side of Rattlesnake Gulf.

The Valley Heads advancal phase represents a shift in the center of the outflow, with a short-lived stand at the location of the Tully Moraine during late Wisconsinan time rather than a separate retreat and advance of Wisconsinan ice.

The following sequence is proposed for the late Wisconsinan glacial history for Central New York:

1. End of outflow from Hudson Valley which fanned outward across New York State (Fig. 3). Generalized directions on the map are from 399 striae locations.* It is this phase that was responsible for deposition of the "Olean type" drift.

2. Shift of outflow to a southward direction (Fig. 4) with most activity in the valleys thus bringing the exotic rich Binghamton-type drift into the valleys. This stand was of short duration and resulted in stagnant ice in the Tully Valley at Little York Lake and to a lesser degree farther south towards Cortland. The final activity of this Binghamton phase occurred at the Tully Moraine with outwash being deposited over the stagnant ice in the valley creating the Little York Lakes and numerous smaller kettles to the south towards Cortland.

3. Final shift of ice flow to the southeast (Fig. 5) with the major stand at the Tully Moraine but with a minor readvance to the advancal position just south of Song Lake. Subsequent outwash deposition over ice left at the advancal position created the Tully Kettle Lakes and further covered remnant stagnant ice to the south.

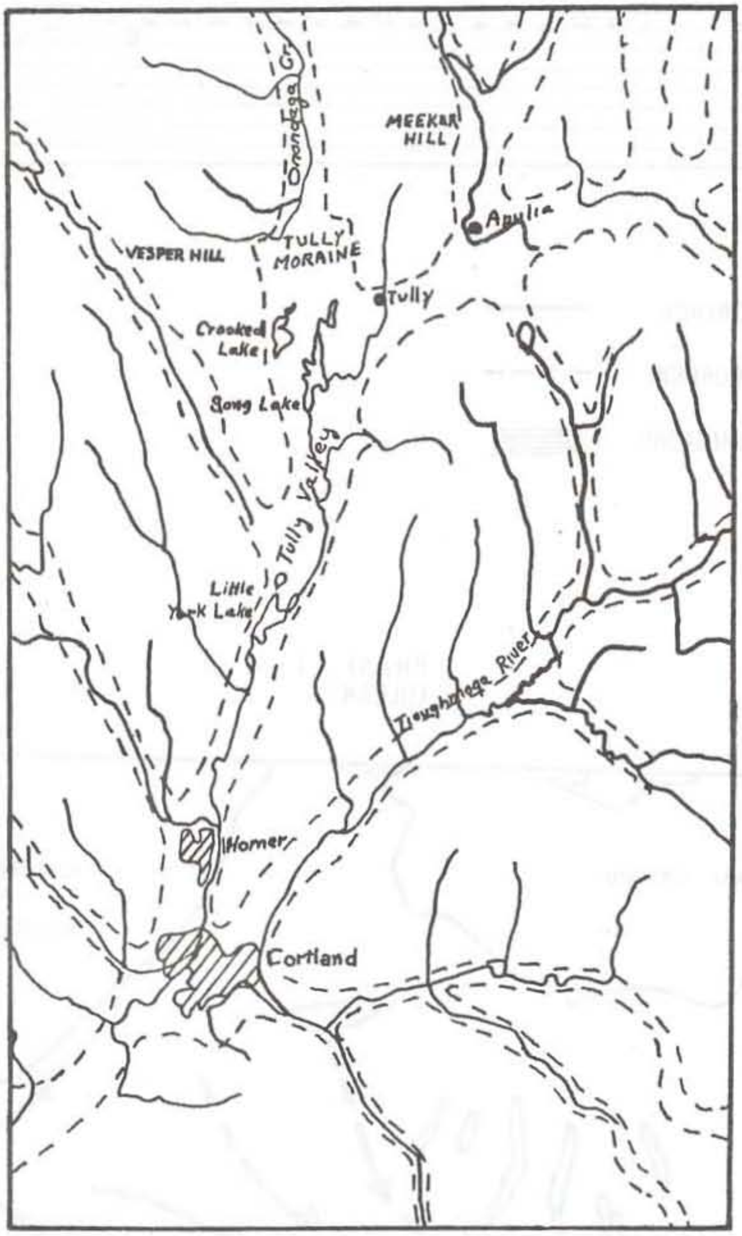
4. Recession from the Tully Region and discontinuation of melt-water drainage from the region.

*The computergraphic routine of the Harvard Laboratory of Computer Graphics was used for analysis of the striation data.

FIG. 1

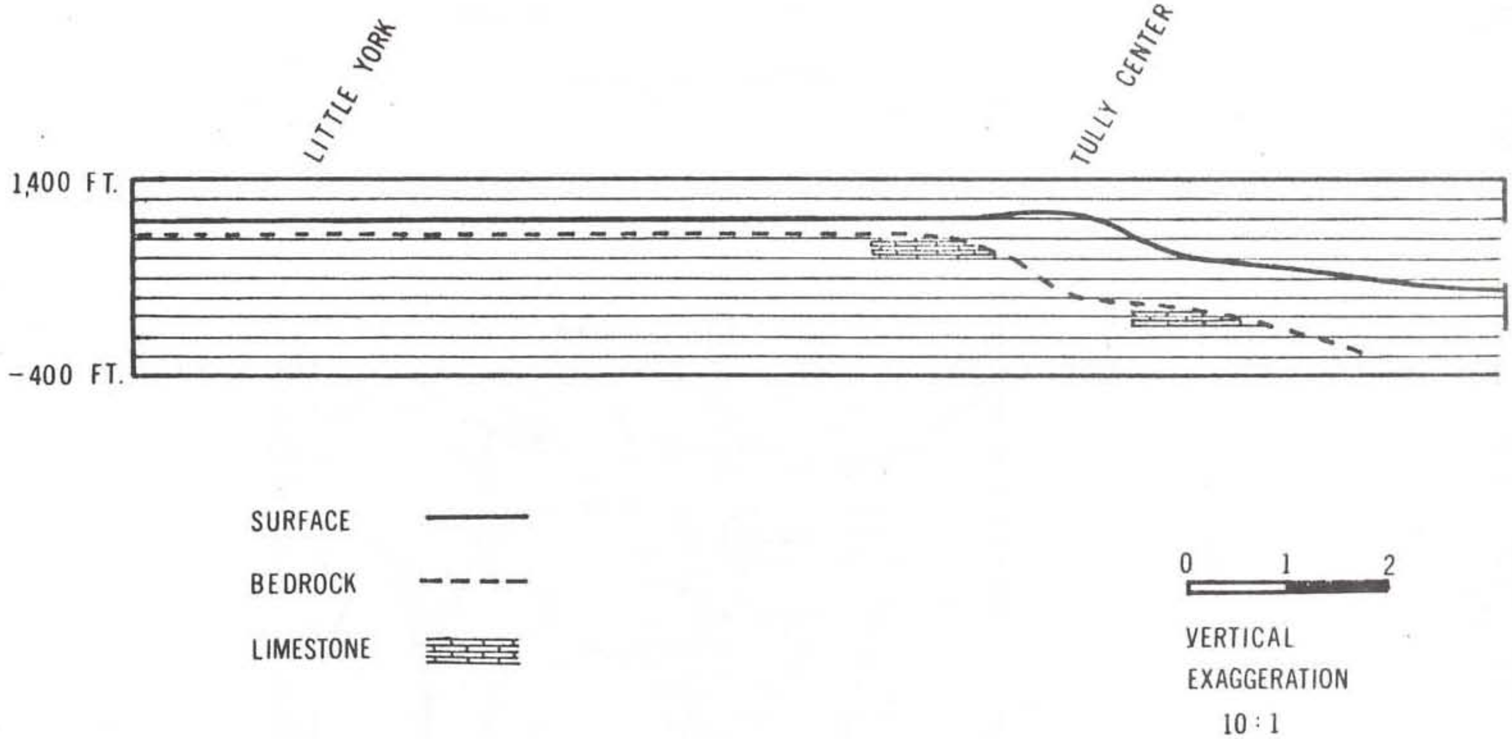
MAP OF THE FIELD TRIP REGION

SHOWING THROUGH VALLEYS



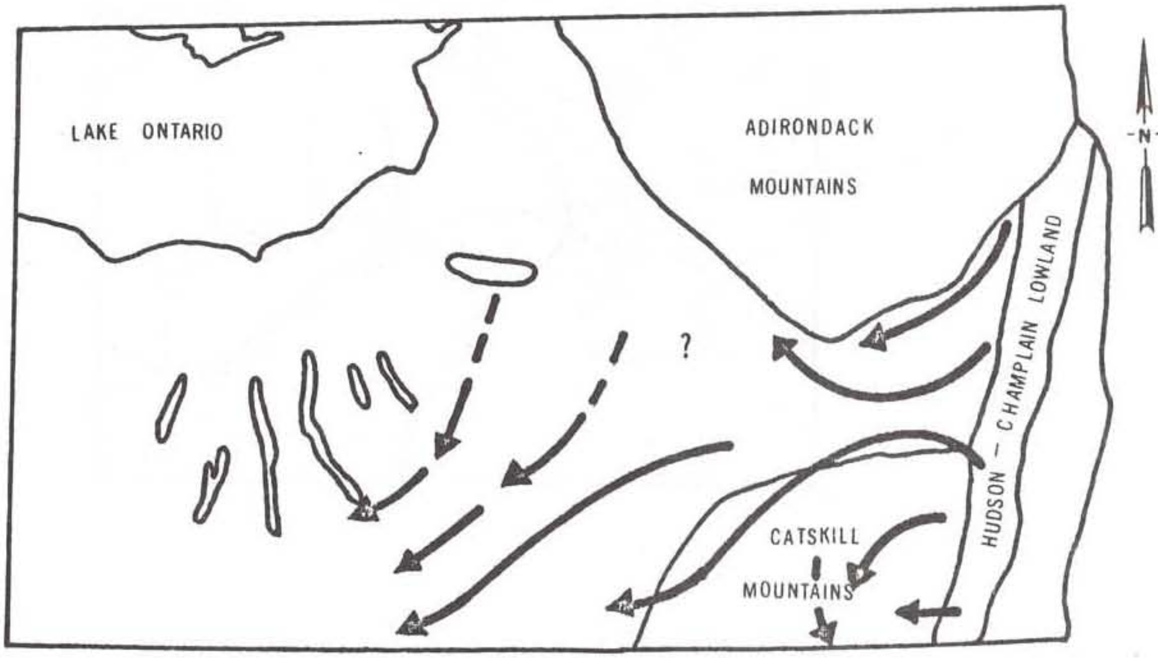
PROFILE OF THE TULLY VALLEY

(FIG. 2)



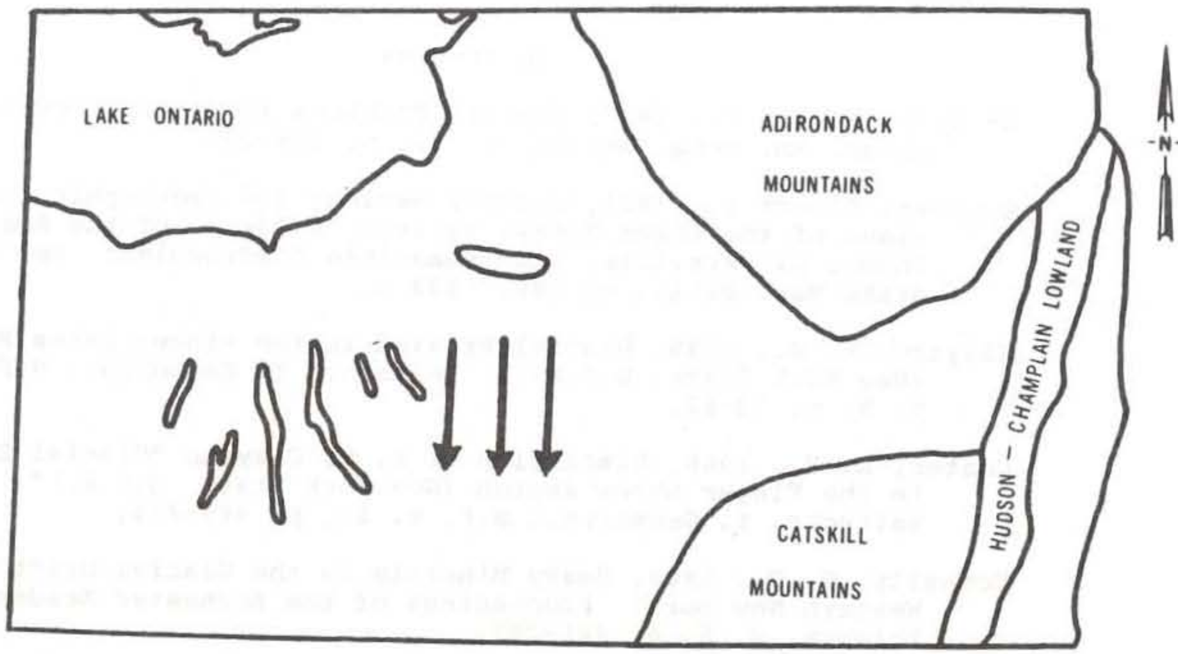
PHASE 1 (OLEAN)

(FIG. 3)



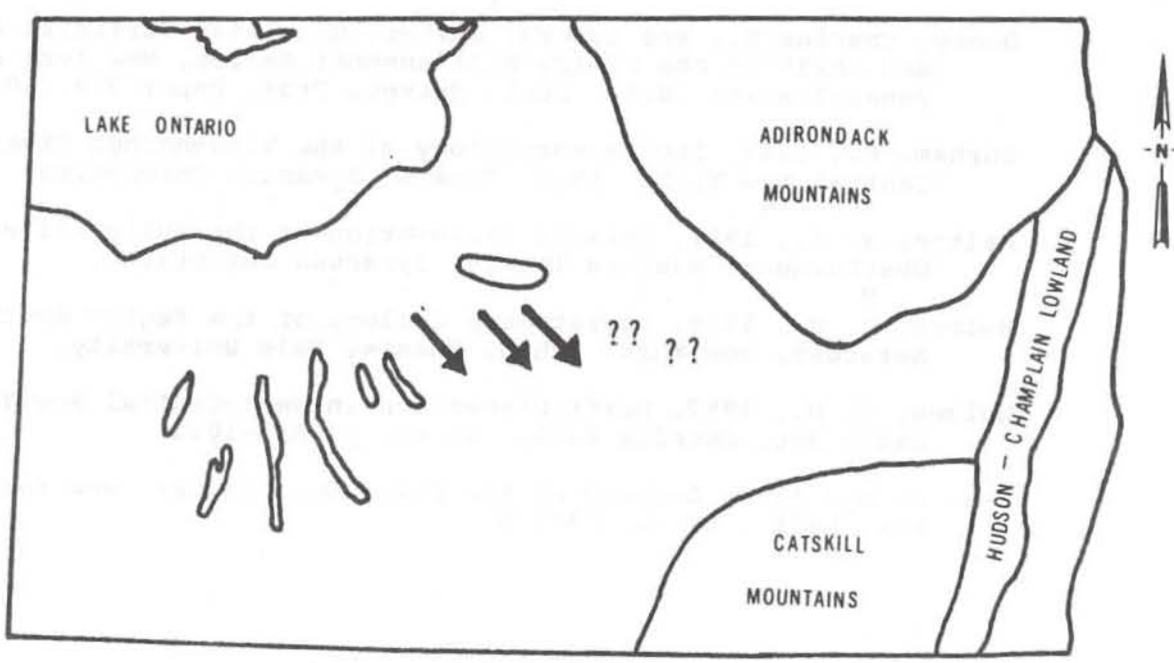
PHASE 2
(BINGHAMTON)

(FIG. 4)



PHASE 3
(VALLEY HEADS)

(FIG. 5)



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TRIP F: DEGLACIATION OF THE EASTERN FINGER LAKES REGION

James Bugh, James Kirkland and George Kelley

Total Miles	Miles from last point	Route description
0.0	0.0	Leave the Holiday Inn and proceed west on Route 13 through Cortland.
1.6	1.6	The campus of the State University College at Cortland is situated on a bedrock hill or umlaufberg which rises 110 feet above the surrounding outwash plain. The knob represents an extension of the ridge extending northeast from Cortland. Muller (1966) attributes the formation of the knob to ..."Concentrated glacial scour at the south end of the Tully-Cortland trough effected the reducing and isolating of the knob. Aggrading valley fill completed separation of knob from upland." Query: How many cycles does the formation of the knob represent and what effect have fluvial processes had in its formation? The valley fill underlying Route 13 is composed of two gravel units, each approximately 50 feet thick, separated by 100 feet of sand and silt. The intermediate unit presumably represents conditions of low gradient and restricted drainage south across the Tioughnioga col. The upper gravel relates to deposition of coarse outwash aggrading east-north eastward from the Valley Heads moraine just west of South Cortland.
3.1	1.5	Proceed past Munsons Corners crossing South Cortland outwash plain, rising southwest at about 20 feet/mile. Several streamlets from the till slope to south disappear into this permeable coarse gravel plain.
4.7	1.6	STOP ONE. SOUTH CORTLAND KAMES. Active borrow pits in kame complex on south flank of valley expose structure of ice disintegration deposits comprising a linear ridge which is relatively smooth on the distal slope but with massive kame-like aspect to the northwest. Lateral variability of sorting and coarseness is characteristic. The gravels are characterized by crystalline-carbonate-clastic relationship of about 5:15:80 which is representative

TRIP F (Continued)

Total miles	Miles from last point	Route description
		of through valley drift in this area. The kame complex contains sections of highly cemented gravels. What does this indicate about carbonate leaching and ground water conditions?
5.2	0.5	Turn right (N) on Webb Road toward Fish Hatchery. Descend sharply on ice contact face of kame terrace, into complex of ice disintegration deposits marking stagnant toe of north-eastward trending Valley Heads ice tongue.
		Continue north through Gracie across ice disintegration complex.
6.2	1.0	Turn right (E) on Lime Hollow Road. In 0.6 mile cross abandoned meltwater channel cut by stream flowing from melting ice blocks responsible for the Fish Hatchery kettles. Return to kame terrace.
8.2	1.6	Turn left (N) onto Route 13. At "Y-intersection", in 0.2 mile, bear left on Route 281. Cross Otter Creek. Note lake of post glacial modification of outwash plain.
10.1	1.9	Turn left (W) onto Kinney Gulf Road built largely across alluvial fan of Dry Creek. In 1.3 miles Dry Creek and road pass through narrow rock-walled gorge which shortly opens out to form Kinney Gulf. Leave Cortland 7½' quadrangle.
		Cross southwest corner of Homer quadrangle and enter Sempronius 7½' quadrangle.
13.8	3.7	Rise across outwash to well-defined Valley Heads valley-stopper moraine which forms divide between Dry Creek (Susquehanna drainage) and headwaters of Fall Creek (St. Lawrence drainage).
14.7	0.9	At "T-intersection", turn left onto Route 90. Carney (1909) reported glacial striae to be oriented S45W on summit of West Hill to north of intersection.

TRIP F (Continued)

Total miles	Miles from last point	Route description
16.0	1.3	Turn right (N) on Lake Como Road. On summit of southeast end of Summer Hill west of route, Carney (1909) reported glacial striae to be oriented S71E, indicating opposing directions of ice flow during late Wisconsin Stage.
16.9	0.9	Turn right (E) onto West Hill Road. Cross small tributary of Fall Creek which drains Lake Como.
17.2	0.3	Turn left (N) toward Como. To northwest (left ahead) the valley floor opens out as an inter-morainal basin, part of which is occupied by Lake Como. Lower slopes enclosing the basin on north and east are marked by strong kame and kettle development.
18.6	1.4	Turn right (E) at Como onto Homer Gulf Road (Route 41A) and proceed across nose of stagnant ice deposits at drainage divide, before entering Homer Gulf, a canyon incised 300 to 500 feet deep. Re-enter Homer 7½' quadrangle.
21.7	3.1	STOP TWO. HOMER GULF. Post-glacial modification of the upper part of the Gulf is minor, and latest gorge-cutting relates to Valley Heads glaciation. Note the fan deposited by water from Homer Gulf in the Skaneateles trough. Query: Is this gulf a product of a single episode of gorge-cutting? Is the moraine position on the divide co-incidental?
21.9	0.2	Turn left (N) onto Route 41 proceeding north over outwash and postglacial alluvial fan deposits of Skaneateles trough. In about 2.3 miles cross Valley Heads terminal moraine. Road follows an open, irregular channel cut by meltwater during wasting of stagnant toe of the Skaneateles ice tongue.
26.0	4.2	Proceed north on Route 41 through Scott, thence following valley of Grout Brook. Enter Otisco Valley 7½' quadrangle.

TRIP F (Continued)

Total miles	Miles from last point	Route description
27.7	1.6	Stay right at fork, climbing to summit on Ripley Hill Road.
30.3	2.6	STOP THREE. RIPLEY HILL SUMMIT At elevation of 1986 feet above sea level Ripley Hill is one of the highest points in Onondaga County and representative of the heavily scoured but relatively unreduced remnants of an essentially accordant pre-glacial summit surface. If pre-glacial summit accordance is accepted, the present departure from summit accordance affords a measure of summit reduction by glacial scour. Elongation of ridges commonly relates to ice-flow. Through valleys, long interpreted as showing a pattern inherited from pre-glacial stream systems, have recently been referred to as "intrusive troughs" implying only minor dependence on inherited pre-glacial controls. Proceed north on Ripley Hill Road.
31.5	1.2	Turn right (E) onto Cold Brook Road. Proceed southeastward on Cold Brook Road, enter Otisco Valley 7½' quadrangle, through South Spafford; enter Homer 7½' quadrangle, through East Scott, to Pratt Corners. The road parallels Cold Brook, a southward draining stream tributary to the Tioughnioga River.
41.1	9.6	Turn left (N) on Route 281 at Pratt Corners.
42.7	1.6	STOP FOUR. DWYER PARK GRAVEL PIT. The upper 3 feet of stratified outwash has been interpreted on the basis of heavy mineral studies to represent the last or Valley Heads phase of Wisconsinan Glaciation while the lower approximately 8 feet of gravel represents the earlier Binghamton phase. Return to Route 281 and turn right (N). On the west side of the valley is Mount Toppin, which Von Engeln (1921) refers to as a truncated spur, the result of glacial scour. Holmes (1939) accounts for the over steepened appearance of the east facing valley wall by differential

Total miles	Miles from last point	Route description
		insolation and therefore greater deposition on the east side of the valley.
44.2	1.5	STOP FIVE. OTISCO VALLEY FAN. South of Preble is evidence that the ice tongue in Otisco Valley was active for a longer time than the ice in the Tully-Cortland trough. A fan was deposited by waters from Otisco Valley over the outwash from the Tully Moraine. Note that the southern part of the fan is a collapsed surface. Buried ice must have extended into the valley with melting and collapse in progress as glacial water was distributing the fan material.
		Continue north on Route 281 on the outwash materials of the Tully-Cortland trough. The road trends to the east side of the valley to skirt the Tully Lakes kame and kettle complex on the west side of the valley. Cross the southeast corner of the Otisco Valley 7½' quadrangle and enter the Tully 7½' quadrangle.
49.4	5.2	Turn left (W) on Route 80 at Tully Center and proceed west onto the Tully Moraine, parallel to steep slope marking the proximal border of the moraine. Kettles are to be seen on both sides of the road.
50.6	1.2	STOP SIX. SOLVAY GRAVEL PIT. Steep-walled gravel pit exposes materials composing major part of Tully moraine, showing it to be largely a product of outwash deposition from a stationary to narrowly oscillating ice margin. Exotic component in this through valley gravel is high with crystalline-carbonate-clastic ratios on the order of 10:40:50. The "bright" character of the gravels results from proximity to carbonate sources, attrition of diluting shale fraction from the lake plain, and effectiveness of glacial transport in a major through valley.
		Query: How can we account for this ratio in view of the 5:15:80 ratio found at the Cortland kames?

TRIP F (Continued)

Total miles	Miles from last point	Route description
52.3	1.7	Turn around and proceed (E) on Route 80 toward Apulia. About 0.5 mile east of Tully cross low, smoothed valley choker moraine, convex eastward. This moraine may correlate with the "advance Valley Heads" position defined in Tully Valley by the outer border of the Tully Lakes area. If so, the smoothed nature of this ridge is puzzling, but may relate to imponding at the ice margin.
54.0	1.7	Continuing eastward on Route 80, near Markham Hollow Road enter Valley Heads moraine complex of Butternut trough. Proximal margin of moraine is less sharply defined than in Tully Valley. "Main Valley Heads" position is south of Apulia Station.
55.8	1.8	Turn right (S) onto Route 91 in Apulia. The Apulia-Fabius trough extends eastward for several miles. Although segmented by drift deposits that define the heads of several drainage basins, this valley has the continuity suggestive of origin as part of a south-westward draining pre-glacial stream system.
56.4	0.6	Cross moraine ridge. Toward axis of north-south through valley this ridge separates into three small but well-defined ridges marking recession of "advance Valley Heads" ice. The road follows a marginal meltwater channel between moraine ridge and valley wall.
57.7	1.3	Meltwater channel widens, opening onto outwash plain upon which shallow Labrador Pond is located. Valley floor is less than 0.5 mile wide between 750 foot walls which converge southward as though toward a bedrock col. Labrador Pond, however drains southward by Labrador Creek on gradient developed by outwash deposition.
		Query: How does the transverse relationship of the Apulia-Fabius trough and the Butternut-Labrador trough clarify the relative importance of inherited valley system as opposed to glacier scour in determining the through valley pattern of this part of the plateau?

TRIP F (Continued)

Total miles	Miles from last point	Route description
60.0	2.7	Cross Shackham Brook. State reforestation area and experimental drainage basin to east of route. Kame complex developed in valley wall re-entrant where Shackham Brook debouches into Labrador trough. Leave Tully, enter Truxton 7½' quadrangle.
61.8	1.8	Pass Labrador Mountain Ski resort.
63.0	1.2	STOP SEVEN. TRUXTON TOWN HIGHWAY DEPARTMENT BORROW PIT. Stratified sand and silt, with foreset beds and collapse structure. Dominance of shale in gravel, with small percent of crystallines and carbonates indicates dilution by uptake of local rock material. Rapid attrition of such material with fluvio-glacial sorting might within a few miles of through valley transportation "brighten" even this drab gravel, giving it a Binghamton-type lithology.
64.0	1.0	Turn right onto Route 13 in Truxton, birthplace of J. J. McGraw, for 30 years manager of the New York Giants.
69.4	5.4	Continue southwest through East Homer settled by Revolutionary War veteran John Albright in 1827. Route 13 lies along valley of East Branch Tioughnioga Creek, apparently a major tributary of the pre-glacial drainage line inferred to have extended west from Cortland toward Cayuga trough.
71.1	1.7	Continue southwest past East River, on Route 13 toward Cortland. Leave Truxton, enter Homer 7½' quadrangle. Coarse kame terrace gravels exposed in several pits in next three miles. Esker parallels Route 13 south of Light House Road where John Miller built first cabin in 1792. Note that the East Branch Tioughnioga Creek is diverted to the south side of the valley by the alluvial deposits of the south flowing tributaries. Since the recent floodplain deposits are generally less than eleven feet thick, the fan-shaped deposits are now being

Total miles	Miles from last point	Route description
		eroded and there is a general lack of new fan deposition, the East Branch Tioughnioga Creek must have been diverted by these fans shortly after the ice melted from the valley,
72.5	1.4	STOP EIGHT. GRAVEL PIT IN COARSE TILL. The till was part water-laid and there is outwash material at the south end of the cut.
		Continue southwestward on Route 13 passing gravel pit with well stratified sediments on the right (N) in 0.9 miles. Enter the Cortland 7½' quadrangle.
75.0	2.5	Pass under Interstate Route 81 and cross West Branch of Tioughnioga Creek. Draining the Tully-Homer-Cortland trough, this creek joins the East Branch of Tioughnioga Creek 0.5 miles east. The combined discharge drains south in a through valley with converging walls indicative of a pre-glacial divide a few miles south of Cortland.