

LETTERS TO THE EDITOR

Reply to Comment on “Late Wisconsinan Glaciation Models of Northern Maine and Adjacent Canada”

A major point in the comment of Lowell *et al.* (1983) refers to the description and interpretation of the lithostratigraphic unit that we (Genes *et al.*, 1981) have referred to as the St. Francis till. Lowell *et al.* state that they see no basis for the assignment of a pre-late Wisconsinan age for this unit.

The Golden Rapids stratigraphic section to which Lowell *et al.* refer bears little resemblance to the section that we have observed. Their “interpreted stratigraphy” of that section was presented at the 1982 Northeastern Section Meeting of the Geological Society of America (Becker *et al.*, 1981) and was included in an initial comment on our paper submitted to *Quaternary Research*. Their letter was subsequently withdrawn and edited after our reply was received. The present comment by Lowell *et al.* does not include the diagram mentioned above but their comment is based on that diagram.

At Golden Rapids, the compact, silty to clayey, calcareous, dark gray St. Francis till is exposed from 3 m to approximately 7 m above the level of the St. John River. On the diagrams of both Lowell *et al.* and Becker *et al.* the position of the St. Francis till is indicated by “covered interval.”

A gradational contact extending through a 1.5-m-thick sheared and mixed zone separates the St. Francis till from overlying Van Buren till. Fabrics from the St. Francis till indicate lodgment by east–west ice flow. Fabrics from the mixed zone and the overlying Van Buren till suggest lodgment by northeast–southwest ice flow.

The Van Buren till contains readily identifiable granite gneiss and anorthosite indicators derived from the Canadian Shield.

At this writing Canadian Shield erratics have not been found in the St. Francis till exposed at Golden Rapids, Rankin Rapids, and Hammond Brook. The absence of Canadian Shield clasts in the St. Francis till and the presence of numerous cobbles and boulders of Canadian Shield origin in the overlying Van Buren till strongly suggest that the Van Buren and St. Francis tills indeed represent two distinct tills with different provenances. The distribution of Canadian Shield clasts also argues against the Van Buren till being an ablation phase of the St. Francis till.

The areal extent of the St. Francis till is unknown. It occurs as small, irregular till masses located at the base of sections at Golden Rapids, Rankin Rapids, and Hammond Brook. At Hammond Brook the upper 0.3–0.5 m of the dark gray St. Francis till is oxidized. Only at Golden Rapids are the St. Francis and Van Buren tills superposed. At Hammond Brook, Van Buren till occurs in close proximity to the St. Francis till but the two units are not superposed. The lower till at the Hammond Brook locality has been correlated to the St. Francis till of Golden Rapids based on similarity of texture, stratigraphic position, and the absence of both granite gneiss and anorthosite indicators.

Researchers in western New Brunswick have also observed a lower gray till. Rampton and Paradis (1981) refer to “grey tills exposed in multiple till sections along the St. John River Valley . . . (which) appear to be separate units not seen in other areas.” Specifically, at a locality north of Perth, New Brunswick, and southeast of Hammond Brook, Maine, they state, “At

locality 6, a grey till having an apparent east–west fabric and containing rare granite and gneiss boulders underlies a thick sequence of gravel and sand (the gravel and sand underlie the tills reported previously at that locality).”

Continuing from Rampton and Paradis (1981):

The chronology and provenance of the ice depositing the tills is presently unknown . . . the interfingering of grey and brown till at some localities would certainly suggest that the different ice sources or modes of deposition were interacting within one interval of glaciation. The presence of gravel between the brown tills at locality one . . . and possibly between the upper brown till and grey till at localities 6 and 7 . . . suggest an interval of deglaciation between deposition of tills. In addition, about 10 m of gravel and sand separate the lowest grey till from the other tills at locality 6. . . . Apparent oxidation of the upper 0.5–1 m of the lowest grey till would also suggest a nonglacial interval between deposition of it and other tills in this section.”

Lowell *et al.* also state that their studies of the exposure, which include detailed measured sections, data from a 4-m-deep test pit, and the log of a drill hole to bedrock, lead to a different description of the stratigraphy exposed at that locality.

We are somewhat puzzled as to the meaning of their statement. The Golden Rapids section occurs along the St. John River. Mass wasting associated with stream erosion and highway construction have exposed the section. There are no 4-m-deep test pits nor drill holes to bedrock at the Golden Rapids locality. To the best of our knowledge the nearest logged borehole to bedrock occurs in the Allagash area some 7 to 8 miles to the west.

They further state: “We have had numerous discussions in the field with Genes *et al.* and have as yet been unable to agree with those workers upon which units are present in the Golden Rapids exposure, much less the interpretation of the units.” We admit that there has been little constructive discussion of mutual field problems with Lowell *et al.*; however, during

the 1980 New England Intercollegiate Geological Conference Field Trip to Golden Rapids (Genes and Newman, 1980), and on many other occasions prior to and subsequent to the NEIGC trip, the lithology and stratigraphy of the section were discussed with numerous Canadian and American colleagues. No one has argued against the existence of the till unit which we refer to as the St. Francis till but which is represented by Lowell *et al.* and Becker *et al.* as “covered interval.”

We agree that in the very northern and northwestern portion of our study area sensed striae indicate northerly ice-flow directions. We have corrected our initial findings in a forthcoming symposium paper that was submitted nearly a year ago. We agree with the findings of other investigators around our northern border, which includes Canada and the Allagash region of Aroostook County, Maine, but disagree that nearly one-quarter of our study area exhibits northerly trending striae. The 7000 km² to which Lowell *et al.* refer includes the Allagash region which is not within the boundaries of our study area.

Finally, regional mapping programs (which formed the basis of our work) are by definition reconnaissance in nature. This is clearly apparent in the first and final two paragraphs of our introduction. Our primary concern in this paper deals with glaciation models, the conclusions of which are based on evidence known at the time. Only generalized geology and surficial maps were introduced; hence it is clearly evident that our paper is intended as a synthesis of existing evidence and not a final report.

REFERENCES

- Becker, D. A., Lowell, T. V., and Calkin, P. E. (1981). Late Wisconsin Stratigraphy, Upper St. John River, Northwestern Maine. *Geological Society of America, Abstracts, Northeastern Section* 14, 4.
- Genes, A. N., and Newman, W. A. (1980). Wisconsinan glaciation of northern Aroostook County. In “The Geology of Northeastern Maine and Neighboring New Brunswick, 69th Annual Meeting.

New England Intercollegiate Geological Conference" D. Roy and R. Naylor, (Eds.), pp. 179–188.

Genes, A. N., Newman, W. A., and Brewer, T. (1981). Late Wisconsinan glaciation models of northern Maine and adjacent Canada. *Quaternary Research* 6, 48–65.

Lowell, T. V., Kite, J. S., Becker, D., and Borns, H. W. (1983) Comment on "Late Wisconsinan Glaciation Models of Northern Maine and Adjacent Canada." *Quaternary Research* 19, 000–000.

Rampton, V. N., and Paradis, S. (1981). "Quaternary Geology of Woodstock Map Area (21J), New Brunswick." Map Report 81-1. Nat. Res. New Brunswick.

ANDREW N. GENES
*Department of Geography and
 Earth Science
 University of Massachusetts,
 Huntington Campus
 Boston, Massachusetts 02115*

WILLIAM A. NEWMAN
*Department of Earth Sciences
 Northeastern University
 Boston, Massachusetts 02115*