DISCUSSION

LITHOTECTONIC ASSEMBLAGES AS PORTRAYED ON THE NEW BEDROCK GEOLOGIC MAP OF MASSACHUSETTS

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Hatch and others (1984) explain the reasons for grouping the 343 lithic units shown on the new Bedrock Geologic Map of Massachusetts (Zen and others, 1983) into eight lithotectonic units. In their Introduction, they say this was done to elucidate the presentation of material on the map. Later in the paper, however, they invoke the same units in the context of a terrane analysis, stating (p. 1031) ". . . thus indicating that these two zones were sutured together by the Silurian if not earlier." It is important to keep in mind that the geologic and cartographic problems faced in producing a complex map do not necessarily coincide precisely with the problems faced in studying the rocks themselves. The authors have demonstrably achieved an elegant solution to the former problem. I question, however, the validity of some of their units for terrane analysis.

Terrane analysis should properly proceed from youngest to oldest because a discontinuity overlooked in younger rocks may invalidate correlations of older units. I have no reason to question the integrity of the Mesozoic basins units of Hatch and others (1984).

O'Hara and Gromet (1983) have argued persuasively that significant Permian motions occurred along the Honey Hill fault. Presumably the Honey Hill fault extrapolates into the Lake Chargoggaggoggmanchauggagoggchaubunagungamaugg and Bloody Bluff faults. Zartman and Naylor (1984) demonstrated that the Bloody Bluff fault separates terranes that could not have been closely juxtaposed in Silurian and possibly even Middle Devonian time. These studies indicate that the Milford-Dedham zone of Massachusetts (which closely resembles the Avalon zone of Newfoundland) evolved separately from terranes to the west throughout much of the Paleozoic Era. Correlations of the Avalonian Milford-Dedham rocks with rocks to the west are thus suspect.

Important sutures may occur within the Siluro-Devonian Connecticut Valley and Merrimack belts of Hatch and others (1984).

Correlation of units on the western and eastern flanks of the Connecticut Valley belt is a venerable problem in Appalachian geology. To the west lies a package of Siluro-Devonian rocks long described as the "Vermont Sequence." The western margin is structurally complex (having juxtaposed rocks differing greatly in competence at the time of the Acadian Orogeny), but over several long stretches, the Silurian basal units of the "Vermont Sequence" are interpreted to lie unconformably on older rocks. The eastern margin is considerably more variable. From Fort Kent, Maine, to near Claremont, N.H., Devonian or undated slates rest directly on pre-Silurian units of the Gardner Mountain, Boundary Mountains belt. South of Claremont this distinctive belt of pre-Silurian rocks dis-

appears, shifting the eastern margin of the belt over to the Bronson Hill belt. The Siluro-Devonian cover rocks of the Bronson Hill belt have long been known as the "New Hampshire Sequence." Despite some similarities in age and lithologic sequence, the rocks on the two flanks of the "Synclinorium" fail to match in detail. Correlations that seem superficially attractive lead to problems of the sort that Hatch and others (1984) say they will address in future articles.

I do not believe correlations across the Connecticut Valley belt are secure enough to prove that the underlying terranes have been juxtaposed since Silurian time. It is possible or even likely that the belt harbors one or more significant Acadian sutures.

Subsequent to the report by Lyons, Boudette, and Aleinikoff (1982), there has been widespread suspicion that the Merrimack belt can be subdivided into two non-correlative parts. Near Rangeley, Maine, the west flank of the Merrimack belt is a sequence of Upper Ordovician through Lower Devonian clastic rocks. Similar rocks have been traced southward to southern New Hampshire (Hatch and others, 1983), and some of these units probably continue into Massachusetts. These rocks lie disconformably or unconformably on the rocks of the Bronson Hill belt and thicken eastward onto an unseen basement that may be oceanic in character. The eastern part comprises a belt, sometimes called the Merrimack Trough, characterized by the Flume Ridge, Bucksport, Berwick, (eastern) Paxton, and Hebron Formations. Despite diligent searches these units remain unfossiliferous and there is no secure evidence for relating the rocks of this belt to the Siluro-Devonian rocks to either side. (See Hatch and others, 1984, p. 1032, footnote.) Gaudette and others (1984) and Bothner and others (1984) argue that the Merrimack Trough (equivalent to the eastern half of the Merrimack belt of Hatch and others, 1984) comprises an independent terrane. Major Acadian structures and lithotectonic belts appear to truncate against this belt, suggesting that its western margin may conceal a suture of Carboniferous or older age.

To summarize, the Connecticut Valley and Merrimack belts lack sufficient continuity to qualify as overstepping units that demonstrate the prior juxtaposition of underlying units. If this evidence is discounted then considerable rearrangement of the correlation of the older belts of Hatch and others (1984) is possible.

The core rocks of the Shelburne Falls, Goshen, and Granville Domes need not correlate with the rocks of the Bronson Hill belt.

The core rocks of the Pelham Dome may be an easternmost exposure of the 1 Ga and younger basement of proto-North America. The quartzites, amphibolites, calc-silicates, crushed pegmatites, and banded gneisses are very similar to rocks exposed in the Berkshires and Green Mountains. Given the similarities Hatch and others (1974) claim for the rocks on opposite flanks of the Connecticut Valley belt it should be feasible to map the cover rocks of the Pelham Dome as belonging to either the "Vermont" or "New Hampshire" sequences. The presence of the Waits River Formation around the Pelham Dome and the similarity of the Erving and Standing Pond Formations suggest the cover rocks are more closely related to

the "Vermont Sequence." Zartman and Naylor (1984) report an age of 550 to 600 Ma for the Dry Hill Gneiss of the Pelham Dome. Rocks about 600 Ma old are known to be associated with the 1 Ga North American basement (for example, the Yonkers Gneiss of Grauert and Hall, 1973). It seems easier to relate the core rocks of the Pelham Dome westward to the North American basement than eastward to Avalonia as proposed by Hatch and others (1984, p. 1030).

As indicated above, the Merrimack Trough may comprise a unique terrane that doesn't correlate with adjacent belts. Hatch and others (1984) state that the Nashoba zone is not easily equated with adjacent belts and explicitly designated it as a separate belt (zone). Possibly it also is a separate terrane. The presence of two suspect and possibly exotic terranes between the Bronson Hill belt and the Milford-Dedham zone would considerably reduce the likelihood that any rock units are common to these two belts.

I fully agree with the closing statement of Hatch and others (1984) that the present understanding of relationships in central and eastern Massachusetts is insufficient to support a unique plate-tectonic model. The characterization of terranes and terrane boundaries is a presently viable and potentially constructive activity. In the early stages of this work it seems better to err by finding too many terranes rather than too few. The mistake of lumping terranes prematurely logically implies the mistake of overlooking the suture separating the terranes, and this in turn causes mistakes in analyzing any older terranes.

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