

*eskers* or *kames* are rougher ridges and hills of rudely stratified coarse and fine gravel, produced by the discharged waters. Drumlins occur in great numbers over New England, especially in Massachusetts and its more northern states, and also in New York and the states west to Dakota. Eighteen hundred drumlins have been observed in Massachusetts alone, and thousands are reported from Wisconsin and the adjoining states.

Eskers are widely distributed over Maine, and are common in other parts of New England and in most regions of the melting ice.

Drumlins are commonly more or less oblong, smooth-featured hills, having the longer diameter in the direction of the movement of the glacier. In allusion to their form, they were called "lenticular hills" by E. Hitchcock, their first describer (1842). Such hills may be shaped by fluvial action from beds of till. But drumlins are generally results of local deposition. Their height indicates a source elevated above the general level. Such a source is afforded by the drift in the lower 200 feet or more of the ice. They were probably formed, therefore, under the ice-sheet, and not far from its melting margin. To gather and pile up the drift within the ice would require the descent of water along crevasses, the water acting by melting, eroding, and transporting. If the crevasse had a direction toward the front, the slow movement of the ice would bring forward new material for the enlargement and elongation of the hill. A large trench is sometimes made about a drumlin to carry off the copiously descending waters.

Crevasses are often due to obstructing rocky ledges or hills below, or to bends in a valley-like depression; and being thus local in origin, the same spot may be long accumulating deposits.

Drumlins sometimes have a nucleal mass of stratified gravel and sand containing occasionally intercalated till; and those of Madison, Wis., have the till confined to an outer shell, 20' or 30' thick. Upham, who has described such drumlins, attributes the nucleal stratified portion to moraine materials over the melting margin of the ice carried down by the superglacial waters; and the till to the final wasting of the glacier, or its removal by the descending waters. They sometimes show their subglacial origin by being crossed by small valleys or trenches of erosion (G. H. Barton).

A drumlin of nearly circular outline, on the west side of the valley at New Haven, Conn., height 115', stands on the summit of a rocky ridge, its base being nearly 200' above the sea level. The valley is the south end of the Connecticut valley near where it passes into the trough of Long Island Sound. The lower part of the ice lying in the valley was moving S. 15° W. But, on reaching the trough of the Sound, it was forced to bend abruptly around to S. 20°–35° E. in order to take the course of the general glacier movement along the Sound. This high isolated drumlin and lower accumulations along the coast westward are evidence of the wrenching and crevassing at the turning spot. This drumlin has, for half of its circuit, a deep valley, made by the deluge of waters that descended the crevasse.

*Eskers* or *Kames*, unlike the drumlins, are rudely stratified accumulations of gravel, sand, and *waterworn* stones. They are of rough fluvial or torrential origin, and occur in long tortuous ridges (serpent-kames), mounds, and hummocks. They have the general direction of the drainage, though sometimes not according with the present course of drainage. They occur usually over the lower lands, outside of the steep mountains where the slopes are not large; yet they are sometimes met with at high elevations. Indian Ridge, near Andover, Mass., was the first of them described (1842, by E. Hitchcock). Several modes of origin have been suggested. Their formation has generally taken place after melting had made great progress over regions favorable to torrential flows; where water, coarse gravel, and sand were freely discharged from the broken and