## UPHAM-ESKERS NEAR ROCHESTER, N. V. 1893.

beneath them. In like manner I have shown that certain eskers in New Hampshire and Manitoba were underlain by ice at the time of their accumulation and by its melting away were afterward allowed to sink to the land.  $(^{1})$ 

## Application of this Explanation to Eskers elsewhere.

If eskers were subglacial deposits, we should expect them to be often covered wholly or partly with the englacial drift, as boulders and loose deposits of till, which would be permitted to fall upon them when the ice-roof was melted away. Such a roof would be more or less overspread with the drift that had been contained in the higher portions of the ice-sheet and was exposed on its surface by ablation. Sections indeed are occasionally found where subglacial beds of modified drift have become covered by subglacial and englacial till; (\*) but these usually differ widely in their character from the torrential esker and kame deposits, which very rarely contain or bear upon their surface any considerable abundance of boulders or other drift materials that have not evidently been transported, worn, and assorted by water. In nearly all the localities where I have observed boulders or masses of till imbedded within eskers or lying on their surface, the most probable explanation of their derivation has been by falling from the enclosing ice-walls of channels open to the sky, or by being brought while frozen in ice-floes. (3) At only one place, in Dover, N. H., I have found a portion of an esker covered with a deposit of boulders and till which may have fallen from a melting ice-roof, though another interpretation seems to me preferable. (\*)

A different view is taken by Professor W. M. Davis, who regards certain eskers in the vicinity of Auburndale, Mass., which I have repeatedly examined with him and other glacialists, as probably of subglacial origin. (\*) These eskers I think to have been formed in icewalled channels, open above and underlain by a slight depth of ice Extending southward from them are associated sand plains or plateaus, deposited just outside the ice front by the streams which produced the esker ridges. Professor Davis describes a backwardly dipping strati-

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<sup>(1)</sup> Geology of New Hampshire, Vol. 111, 1878, pp. 107, 117. Geol. and Nat. Hist, Survey of Canada, Annual Report, new series, Vol. IV, for 1585 S., pp. 37 (1 E., (2)) Geology of N. H., Vol. 111, pp. 108, 121 (37, 552 (20), Geol, and Nat. Hist, Survey of Minnesota, Eighth Annual Report, for 137, pp. 175, 114, Final Report, Vols. 1 and 11. Proceedings of the Boston Society of Natural History, Vol. XXIV, 1879, pp. 24, 5, 237 (9).