

front as if spreading out on the lowland at the southern entrance to the Highland canyon. It is reasonable to suppose that at this stage the ice pressing against the northern slope of the Highlands and having thinned too much to flow over these ridges forced a long tongue through the Highlands comparable to the ice streams which are pressed out from the inland ice of Greenland to the west coast. With this stage some of the higher terraces and morainal deposits in the Highlands may be associated. Later the ice dwindled away melting at surface and also on its sides thus permitting the deposition of gravels and sands about its margins and over the rock terraces which at this stage bordered the dead ice in the gorge. With the melting out of this ice, the glacial occupation of the Lower Hudson was closed.

An earlier chapter in the glacial occupation of the lower Hudson valley is recorded in the terminal moraine and possibly also in the clays at Haverstraw which are covered unconformably by later sands and gravels. If the view be correct that the terminal moraine at the Narrows is the so called "inner" or Cape Cod moraine and that the "outer" or Nantucket moraine is to be found overrun by ice and suffused in the region immediately north of the Narrows it is probable that in the lower Hudson valley as on the east in Massachusetts the ice advanced some distance in taking up its position along both of these ice fronts. Considering these frontal moraines as respectively culminating the earlier and the later Wisconsin epoch, in the interval between the two episodes of southernmost prolongation of the ice front there would be opportunity for the deposition of some of the older clays which are found as far north as Haverstraw. On the other hand it must be recognized that the advance of an ice sheet causes it to overrun all deposits which have been laid down in front of it in its own time. It does not, therefore, from the evidence at hand, appear possible to conclude definitely whether the Haverstraw clays pertain to the latest Wisconsin or to an earlier epoch. That no clays are found in the lower Hudson overlying the deposits contemporaneous with the ice fronts in the Hudson valley, makes it evident at once that in this field none of the geographic conditions have prevailed which produced the widespread clays of the upper Hudson valley and the Lake Champlain district.