

found in earlier proglacial clays. The water body in which the Albany clays were formed appears to have spread over the rock terraces and across the middle Hudson valley at a time when the region on the south rose above the water level, confining the waters to the excurrent stream lying within the gorge. The land must have been tilted to the north in comparison with its present attitude to have brought about such a distribution of effects. The well known phenomena of the submarine Hudson require also to be explained. While it is difficult to determine at what precise epoch the erosion phenomena there presented had their origin, the theory of high elevation on the south at this time is rendered permissive by the knowledge we have of the old channel.

DISTRIBUTION OF KETTLE HOLES MARGINAL TO THE HUDSON AND CHAMPLAIN VALLEYS

The accompanying plate [pl.28] represents the position and altitude of the kettle holes in the gravels and sands marginal to the Hudson river and the New York side of Lake Champlain. Some of these kettles, as on the Brooklyn sheet are in moraines, but most of them are in plains of gravel and sand marginal to masses of ice which lay at one stage or another in the valley. Excepting the type of kettle which occurs in the Brooklyn moraine, those northward along the Hudson and Champlain invariably represent the melting out of detached or buried blocks of ice from local deposits of gravel and sand which were at their time undoubtedly above sea level and presumably, on account of the barrier which the ice of their margin imposed, in an embarrassed drainage and hence above the level of standing waters farther along in the drainage system toward the sea on the south.

Such of these shallow depressions as came within the reach of the clay-bearing waters or later deposits of gravel and sand would have been buried. Thus it is strongly probable that the lower limit of kame kettles in the Hudson and Champlain valley lies at or above the upper limit of local submergence whether by long continued glacial lakes or the incursion of the sea. The lines representing on one hand the lower limit of kettles and on the other the upper limit of standing bodies of water should roughly corre-