

were, to a large extent, fresh, and only occasionally, or else locally, brackish. Moreover, at many intervals, great areas emerged which were speedily covered with marshes and forests in the warm and moist climate, and thus peat-beds were made, which later became coal-beds.

The length of the Laramie Interior Sea in this condition was nearly 2000 miles, it reaching to the parallel of 57° N. ; and another, the Mackenzie valley area, opening on the Arctic Ocean, was 500 miles long. The southern of these Laramie areas was probably tidal as well as the northern. For the width south of 49° N. was 600 to 800 miles, — which is too great for fluvial waters. Besides, the strata are generally cross-bedded in stratification, and they include occasionally conglomerates, proving seemingly strong movements in opposite directions, and at times in some parts violent currents. Moreover, although the waters were generally fresh, still Sea-Saurians, Sharks, and other marine species occasionally ascended to Dakota and beyond. The bay received the drainage from all the bordering lands for the 2000 miles from the Mexican Gulf to the limit of the Laramie beds in British America ; and hence a great amount of fresh water flowed southward toward the outlet.

Hence the tides from the western part of the gulf generally carried in salt waters for a short distance only, and thence the tidal movement was propagated northward by the fresh waters. But occasionally the Gulf waters were able, through a subsiding in the land, to flow far northward, and let in the Sea-Saurians, and Sharks, the Oysters, and other Sea-Mollusks, so as to make the brackish-water fossiliferous beds of the Laramie formation. The spawn of Oysters and other Mollusks would have been rapidly transported.

If the above explanation of the conditions in the Laramie epoch is correct, the distance to which the salt waters of the Gulf were carried in westward and northward, whether one mile or many, is a subject for investigation. The Laramie beds derived their material from the land on the borders of the Interior Sea. The existence of Paleozoic and Mesozoic rocks of various ages about the base of the Black Hills, where there is also the Cretaceous formation, indicate how the other adjoining Archæan lands may have been skirted, where now covered by Tertiary beds and those of the later Cretaceous.

The *Upper Laramie* or *Denver* group was first defined by Cross and Eldridge in 1888. It derives the latter name from its distribution about the city of Denver, east of the Front Range (Archæan) of the Rocky Mountains, where it overlies the Lower Laramie. It is described as resting on the latter unconformably, — the unconformity being, however, not that of bedding in a marked degree, but the unconformity consequent on the previous erosion of the beds on which the formation was deposited. The upper portion in that region, 1400 feet thick, consists largely of the debris of eruptive rocks, mostly different kinds of andesytes ; while the lower part, 800 feet thick, distinguished as the *Arapahoe* beds, is mostly made up of conglom-