OPPORTUNITIES FOR THE STUDY OF SHORE PROCESSES IN ARTIFICIAL LAKES

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No subject in geology has been more frequently approached by the deductive method than the study of shorelines and shore processes. Waves and currents are most active during great storms and the difficulties of making direct observations at such times have prevented investigators from seeing and measuring the changes as they take place. This has generally forced them to resort to studying the completed land forms and attempting to deduce therefrom what has taken place.

In order that the deductive method of study will lead to correct conclusions it is necessary that nearly all the factors of the problem be known from the beginning and that these factors continue constant throughout the discussion. This means that the method is most effective in those cases where the factors are relatively few and the processes easily followed, but in the work of waves and currents the factors are numerous and usually inconstant and the various combinations in which they occur are almost infinite.

As a result of the literature of shore processes is full of inconsistancies and contradictions. Probably no part of geological science stands in such great need of direct, careful observation as does the study of what takes place in the belt between the limits of highest wave work and the lower edge of the under-water terrace. This is an area of great importance to both the engineer and the geologist. What takes place there interests the engineer because of its bearing on the location and building of harbor works and structures to control shore erosion and deposition, and it is of interest to the geologist because it is here that deposition is the most active and where most of the sedimentary rocks are formed.

The problems connected with the adjustment of shores and bottoms are numerous and varied. The following are only a few of the broader ones that are in especial need of study at the present time.

What are the conditions under which the undertow occurs and what is its efficiency in the transportations of sediments?

What are the conditions under which sediment is transported on the subaqueous shelf toward or away from shore?

What is the relative efficiency of shore drifting as compared with the transportation of material by littoral currents?

What are the criteria for determining the stages of equilibrium of the under-water terrace?

What is the relative efficiency of the few great storms in modifying shore lines and bottom profiles as compared with the constant work of lesser waves and currents?

Such problems are becoming of greater and greater importance with the increase in the value of shore property and with the necessary increase in the depth of harbor entrances as the increase in the size of vessels continues.

The United States government recognized the need of such study when it provided for a Beach Erosion Board in The River and Harbor Act of July 3, 1930. So far, much of the work of this board has been along the Atlantic Coast, especially in the vicinity of New Jersey, which, because of its sandy shores, is particularly subject to erosion and to the shifting and filling of its harbor entrances.

At present some experimental work of this character is being done at Vicksburg, Mississippi by the U. S. Waterways Experiment Station in connection with the operation of their harbor models. A laboratory has also been established recently at Washington, D. C., as an aid to the work of the Beach Erosion Board. These laboratory studies are very valuable

but they are also expensive and are necessarily carried out only in connection with some definite and pressing problem of harbor or shore improvement. What is especially needed is studies of a more general nature leading to the determination of the under-lying laws which govern shore processes.

In Oklahoma and some other parts of our country numerous lakes are now being built, some of which are of considerable size. The laws governing the work of waves and currents are much the same on lakes as on larger bodies of water and studies are much more easily made there because of the smaller size of the waves. Artificial lakes are especially adapted to such studies because they are, for the most part, entirely out of adjustment with their basins. Their shore lines mostly have the characteristics of shcre lines of submergence and their under-water profiles are usually above or below equilibrium.

For the best results a detailed topographic survey of an artificial lake basin should be made before it is flooded. This should be followed by studies of the basin at regular intervals by a geologist trained and experienced in hydrography. In this way processes would come under direct observation and many problems would be solved which otherwise are likely to remain for a long time mere scientific guesses.