

SPECIAL POINTS IN FLUVIAL HISTORY.

The history of rivers has been eventful. In the course of the geological past, drainage areas have sometimes changed to areas of marshes, lakes, or ocean; and again back to dry land, with perhaps new limits and slopes. They have experienced changes of level that divided and subdivided them, or forced part of a stream in a new direction for an outlet; that annexed another stream, giving it a new head, and doubling its length, supply of waters, and mean pitch,—as in the case of the Mississippi, which once had the Saskatchewan as its source. They have had portions buried under debris, and have been compelled to make long circuits, and deep cuts, in order to effect a new connection; or have been buried with all their fluvial deposits beneath floods of lavas,—as on the west slope of the Sierra Nevada (Whitney),—and so have made fossil river-channels, some of them to remain buried, others to regain their places wherever the surface conditions favored it. They have had their slopes increased by continental elevation, so that after reaching a state of feebleness, they acquired new energy and were set again to work at the deepening of their channels and the enlarging of their valleys; or they have suffered from subsidences that have slackened the flow over the subsided region and brought on premature old age, or spread a stream into a lazy lake; or by the coming on of a period of enormous precipitation, and of glaciers ending in glacial floods, they have once more been made young and powerful in denudation and transportation over the width of a continent.

Furthermore, streams that originated over a formation covering a country, and derived their courses from its slopes and lines of weakness, have sometimes been forced by the removal, through denudation, of that formation, to chisel down their channels into older underlying beds, and fix upon the latter, as far as possible, their original qualities. An example of a drainage area with such inherited qualities was described, in 1874, by A. R. Marvine (Hayden's Report of 1873), from the slopes east of the Front Range of Colorado. The deposition of Triassic and other strata over the region was followed by its emergence, and the outlining of a system of drainage down the long slopes of the rising continent. But since then the new streams in their upper portion have cut through these strata to the older rocks; and here the work of impressing the courses of the new cañons on these older rocks is going on, mostly irrespective of their slopes and structure-lines. Twelve years earlier, J. Beete Jukes, of the Irish Geological Survey, treating of the mode of formation of some river-valleys in the south of Ireland (*Q. J. G. S.*, 1872), brought out the same general idea that the drainage courses of the present time have often been determined by preëxisting topography.

A course of drainage derived from a formation that once covered the region is called by Powell *superimposed* drainage. Further, if the course of a river is a consequence of the structure of an upturned region, he terms it *consequent* drainage; but if derived from conditions prior to the upturning, *antecedent*. (*Exploration Colorado River*, 1875.)