CHAPTER XIX.

DENUDATION OF THE CHALK AND WEALDEN.

Physical geography of certain districts composed of Cretaceous and Wealden strata—Lines of inland chalk-cliffs on the Seine in Normandy—Outstanding pillars and needles of chalk—Denudation of the chalk and Wealden in Surrey, Kent, and Sussex—Chalk once continuous from the North to the South Downs—Anticlinal axis and parallel ridges—Longitudinal and transverse valleys—Chalk escarpments—Rise and denudation of the strata gradual—Ridges formed by harder, valleys by softer beds—At what periods the Weald valley was denuded—Why no alluvium, or wreck of the chalk, in the central district of the Weald—Land has most prevailed where denudation has been greatest—Elephant bed, Brighton—Sangatte Cliff—Conclusion.

ALL the fossiliferous formations may be studied by the geologist in two distinct points of view; first, in reference to their position in the series, their mineral character and fossils; and, secondly, in regard to their physical geography, or the manner in which they now enter, as mineral masses, into the external structure of the earth; forming the bed of lakes and seas, or the surface or foundation of hills and valleys, plains and table-lands. Some account has already been given on the first head of the Tertiary, the Cretaceous, and the Wealden strata; and we may now proceed to consider certain features in the physical geography of these groups as they occur in parts of England and France.

The hills composed of white chalk in the S. E. of England have a smooth rounded outline, and being usually in the state of sheep pastures, are free from trees or hedgerows; so that we have an opportunity of observing how the valleys by which they are drained ramify in all directions, and become wider and deeper as they descend. Although these valleys are now for the most part dry, except during heavy rains and the melting of snow, they may have been due to aqueous denudation, as explained in the sixth chapter; having been excavated when the chalk emerged gradually from the sea. This opinion is confirmed by the occasional occurrence of what appeared to be long lines of inland cliffs, in which the strata are cut off abruptly in steep and often vertical precipices. The true nature of such escarpments is nowhere more obvious than in parts of Normandy, where the river Seine and its tributaries flow through deep winding valleys, hollowed out of chalk horizontally stratified. Thus, for example, if we follow the Seine for a distance of about 30 miles from Andelys to Elbœuf, we find the valley flanked on both sides by a steep slope of chalk, with numerous beds of flint, the formation being laid open for a thickness of about 250 and 300 feet. Above the chalk is an overlying mass of sand, gravel, and clay, from 30 to 100 feet thick. The two opposite slopes of the hills *a* and *b* (fig. 313), where the chalk appears at