

CHAPTER I.

INTRODUCTORY.

THE earlier students of the physical history of our earth considered that a great gap or strongly-defined boundary-line separated the Present from the Past. Some mighty convulsion of nature was believed to have marked the close of the geological ages, and to have preceded the advent of man and the introduction of the plants and animals with which he is associated. It was hardly doubted that the present distribution of land and water over the earth's surface dated back to a time anterior to the coming of our race, and that when man first entered Britain he had to cross seas that still roll between us and the Continent. In short, it was held that within the human period only a few minor changes had been effected in the physical aspect of our country. It was admitted, indeed, that large areas of forest-land had been displenished, that considerable tracts of peat-moss had grown, and that here and there, where the coasts were formed of incoherent materials, the sea had made some inroads; but no one supposed that greater changes than these had transpired since the first occupation of Britain.

Subsequent research, however, has overturned many of these opinions, and widened our views in regard to the magnitude of the physical changes of which man has been a witness. Not only have great oscillations of climate happened within the human period, but the distribution of land and sea also has undergone very considerable modifications. Seas have vanished and returned, wide areas of land have appeared and disappeared—broad valleys have been hollowed out of solid rocks by running water. It is from a knowledge of these and similar facts that geologists arrive at their estimate of the antiquity of man, and have assured themselves that no mighty convulsion of nature separates the human period from the earlier ages—the deposits which were at one time looked upon as the sure evidence of such a “break in the succession” being now recognised as only so many links in the chain that binds the present to the past.

The study of these deposits has unfolded a deeply interesting and almost romantic history. We are introduced to scenes that are in strangest contrast to what now meets the eye in these latitudes: geographical and physical changes of the most stupendous character pass before us; we see our islands and northern Europe at one time enveloped in snow and ice; at another time well wooded, and inhabited by rude tribes of men and savage animals; now the British Islands are united to the Continent—again, the sea prevails, and a large part of Britain, together with all the low grounds in the north of Europe, are over-

INTRODUCTORY

3

whelmed beneath the waters of an arctic ocean, across which float rafts and bergs of ice. Yet again, we behold the land rising slowly out of the water, and Britain once more becoming continental, and re-peopled. Finally, we follow the working of those physical influences by which at last the present order of things is brought about.

Those who hear of this history for the first time may well be excused if they listen with some incredulity. It seems difficult to understand how the records of such extraordinary events could be preserved; or how, having been preserved, geologists are able to interpret them. Yet there is really no mystery about the matter. Difficulties undoubtedly do arise, and sometimes problems suggest themselves, for which it is hard or even impossible at present to find a solution. Nevertheless the whole matter resolves itself into a question of circumstantial evidence. The facts are patent to every one who will take the trouble to examine them, and the interpretations adduced by geologists are capable of being attested by an appeal to what is actually taking place in the world around us. In the following pages, therefore, I propose to give an outline-sketch of the evidence, mentioning only such details as may serve to bring the salient points clearly before the mind, and endeavouring at the same time to put the reader, who may chance to be not specially skilled in geology, into a position to judge for himself as to the reasonableness of the explanations advanced.

The earlier pages will be occupied with an account

of the later chapters in the geological history of Scotland. We shall trace out the succession of events that marked the origin of certain loose and incoherent materials which overlies the solid rocks of that country, and are represented by similar accumulations covering vast areas throughout the northern regions of our hemisphere. The consideration of the Scottish deposits will naturally lead us to inquire into the principles upon which they and their equivalents in other lands must be interpreted. We shall then describe in succession the superficial accumulations of other portions of the British Islands, of Scandinavia, of Central Europe, and of North America, for the purpose of ascertaining how far the conclusions arrived at by geologists in different countries harmonize with each other. Having traversed this wide field of inquiry, and become aware that the deposits, which were at one time slumped together and vaguely believed to represent a period of wild cataclysms and convulsions, are really the records of a long series of changes, each of which flowed as it were into the other, we shall finally take up the subject of the antiquity of man.

In considering this difficult but important and interesting question, it will be necessary to treat first of the special evidences which have been adduced by archaeologists and geologists, to prove the great age of our race. Thereafter we shall endeavour to determine what is the exact position in the geological history of those deposits which contain the very oldest traces of man. Our aim, in short, will be to discover,

Cambridge University Press

978-1-108-05008-1 - The Great Ice Age and Its Relation to the Antiquity of Man

James Geikie

Excerpt

[More information](#)*INTRODUCTORY.*

5

if possible, at what stage during those great climatal and geographical revolutions, which shall have previously engaged our attention, man certainly occupied Britain. If we are able to determine this point, we shall have paved the way for eventually arriving at some approximately definite estimate of the antiquity of man in Western Europe.

CHAPTER II.

SUPERFICIAL FORMATIONS OF SCOTLAND.—THE TILL.

General distribution of Superficial formations.—Till, the oldest member of the series.—How this is proved.—Character of the till.—Stones in the till.—Unfossiliferous character of the till.—Till developed chiefly upon the low-grounds.—Its aspect in upland valleys.—“Sowbacks” or “drums” of till.—“Crag and tail.”—Smoothed and broken rocks below till.—Configuration of mountains and hills.—Lines of stones in till.—Subjacent and intercalated beds.—Résumé.

THROUGHOUT the length and breadth of Scotland occur numerous scattered heaps and ragged sheets of sand, gravel, and coarse débris, and widespread deposits of clay, beneath which in many places, especially in the lowland districts, the solid rocks that form the framework of the country are in great measure concealed. The general character of these superficial heaps and gatherings must be familiar to every one. They appear in the scaurs and bluffs that overhang our streams and rivers, and are often well-exposed by the wash of the waves along certain sections of the sea-coasts. The traveller by rail can hardly fail to notice them as he is swept along—here capping the rocks with a few feet of sand and gravel, there thickening out so as to form the whole face of the cutting from top to bottom. In the numerous quarries with which the country is pitted the rock is

SUPERFICIAL FORMATIONS.—THE TILL. 7

commonly crowned with a more or less thick covering of similar materials ; while in sinking for coal and ironstone, and in digging foundations for houses and bridges, superficial accumulations of such débris no less frequently occur. Bricks and tiles are manufactured in large quantities from the beds of clay, and the heaps of sand and gravel, occurring as they often do at a great distance from the sea, are much in request by builders, farmers, and others.

So widely are the superficial deposits distributed that they may be said to be common to every part of the country, for they are met with from Zetland to the Cheviots, and from the Outer Hebrides to the east coast. But while they occur over so wide an area they are at the same time very unequally aggregated. In the highland and upland districts they appear to be for the most part restricted to valleys—the craggy broken mountains of the north and the rounded swelling hills of the south of Scotland, showing but little trace of them at the higher elevations. Over the intervening Lowlands, however, they spread in broad but somewhat ragged sheets, which are often continuous across wide tracts.

The materials of which these deposits are made up consist principally of stony clay, fine brick-clay, silt, sand, gravel, and a kind of loose débris of earthy clay and stones. At first sight these various beds appear to be confusedly intermingled, and to show little order in the mode of their occurrence. Sometimes stony clay, at other times sand or gravel, overlies the solid rocks. Again, these deposits may be absent

and a fine brick-clay, or a coarse débris of stones and large blocks may cumber the ground instead. But this confusion is only apparent—a regular succession does really exist. It frequently happens that in deep artificial excavations, or natural sections, several varieties of these loose materials occur together. And when this is the case we invariably find that the lowest-lying member of the series consists of a tough stony clay. Above this stony clay, or *till*, as it is called, come beds of sand and gravel, or, as the case may be, a loose earthy débris of stones and large blocks and boulders. But in the neighbourhood of the sea it often happens that the first deposit resting immediately upon the till is fine brick-clay. Thus, whenever the till or stony clay appears in the same section with any of the other superficial deposits, it invariably lies at the bottom. Hence we conclude that of all these deposits the till is the oldest, since it must have been laid down in its present position before the other heaps of material could have gathered over its surface.

It is only now and then, however, that the lowest-lying or oldest superficial accumulations are overlain by later formed deposits. Throughout wide districts stony clay alone occurs, just as in other regions heaps of sand and gravel form the only covering of the solid rocks. Yet we can have no difficulty in deciding as to the relative age of the beds; for having already satisfied ourselves that the till constantly underlies the other deposits, when all occur together in one section, we can have no doubt that the former must

SUPERFICIAL FORMATIONS.—THE TILL. 9

be the older accumulation, and that the latter, even when they rest directly upon rock (the stony clay being altogether absent from the district) must have been formed at a later date. A reference to the accompanying diagram (Fig. 1), which represents an ideal cutting or *section*, will help to render these remarks a little clearer. The figure is intended to give a general view of the relation of the underlying till to the overlying sand and gravel series. In this section, t S are the superficial deposits resting upon r r , the solid rocks. It will be observed that the stony clay or till, t , is distinctly covered by the sand and gravel S . At S^x the sand and gravel repose directly upon the rocks r , the till being absent at that point; while at t^x till alone occurs. When the superficial formations are viewed upon the large scale they are invariably found to follow the order indicated.

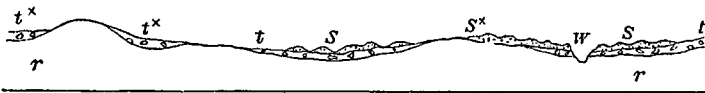


Fig. 1.—Diagrammatic section, showing relative position of till t t^x and overlying sand and gravel series S S^x . W . = river valley.

It has already been mentioned that besides sand and gravel various other kinds of materials sometimes overlie the till. To determine the relative position of these accumulations the same kind of reasoning applies. There are other methods, however, by which this is ascertained, but a consideration of these must be deferred to a subsequent page. At present our attention is confined to the stony clay or till. This deposit and the overlying beds have received one

general name—the Drift or Glacial formation; and it is usual to speak of Lower and Upper Drift, according as we refer to the stony clays or the deposits above them. In this and the following chapter I shall consider the character and phenomena of the Lower Drift, for which purpose it will be necessary to enter into some little detail. But these details are absolutely necessary if the reader would understand clearly the nature of the problem which a survey of the drift-phenomena suggests. It would, however, lead me far beyond due limits were I to attempt to give anything like an exhaustive account of the till. All I shall try to do will be to gather together into a short space what appear to be the more salient points in the evidence, from an attentive consideration of which the reader will be able to judge for himself how far the inferences set forth in the sequel are justified.

The deposit known as *till* is usually a firm, tough, tenacious, stony clay. So tough indeed does it often become that engineers would much rather excavate the most obdurate rocks. Hard rocks are more or less easily assailable with gunpowder, and the numerous joints and fissures by which they are traversed enable the navvies to wedge them out often in considerable lumps. But till has neither crack nor joint—it will not blast, and to pick it to pieces is a very slow and laborious process. Occasionally, however, the clay becomes coarser and sandier, and when this is the case water soaks through it. It then loses consistency, and is ready to “run” or collapse as soon as an excavation is made.