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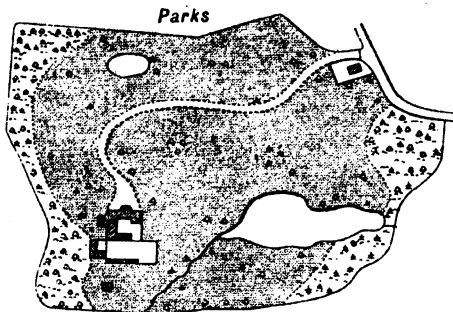
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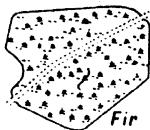
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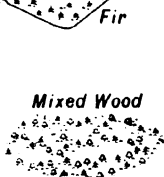
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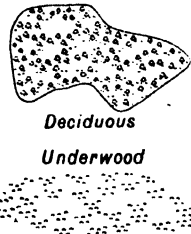
Woods



Orchard



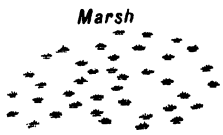
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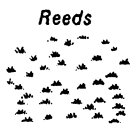
Deciduous

Underwood

Mixed Wood



Marsh



Reeds



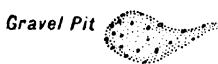
Osiers



Rough Pasture



Furze



Gravel Pit



Sand Pit



Quarry



Shingle

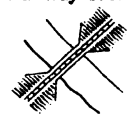


Other Pits

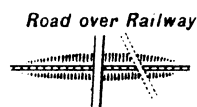


Level Crossing

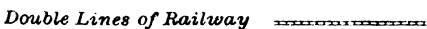
Railway over River



Railway over Road



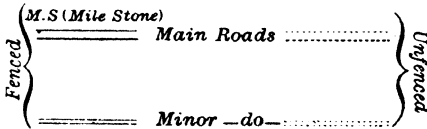
Road over Railway



Double Lines of Railway



Single do & Tramways



M.S. (Mile Stone)

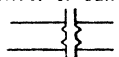
Main Roads

Minor do

Fenced

Unfenced

Road over River or Canal



Road over Stream



Arrow denotes flow of water. > ———

Antiquities, Site of..... +

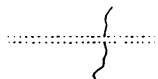
Trigonometrical Station..... ▲

Bench Mark (B.M.)..... ⚡

Pump, Guide Post, Signal Post..... ⚡

Well, Spring, Boundary Post..... ⚡

Surface Level..... -285



Road over Stream



Sunken Road



Raised Road

THE STUDY OF LOCAL GEOGRAPHY

A Handbook for Teachers

BY

CHARLOTTE A. SIMPSON, B.Sc., OXON.

WITH 5 MAPS AND ORDNANCE SURVEY SYMBOLS



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ILLUSTRATIONS

SOME SYMBOLS USED BY THE ORDNANCE SURVEY ON MAPS

6" TO 1 MILE *Frontispiece*

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INTRODUCTION

GEOGRAPHY, especially if studied in close connexion with history, deals with the relation between Man and his environment, and shows how, in regions where conditions are hard, or the inhabitants are 'backward', man is largely controlled by environment, whereas when human beings have been able to 'progress' they can, to a great extent, control nature. But even in regions which are considered the most 'civilized', climate, soil, the relief of land, the presence or absence of surface water, still count. If it can be realized, to a certain extent, how far it is possible for people to adapt themselves to difficult natural conditions, or to make use of those conditions in order to make life easier or richer or more interesting for their fellow-men or for themselves, some of the problems of to-day may become clearer.

Those who are unable to travel much to see far-off lands for themselves must be content to know them from descriptions by travellers, from pictures, and from maps. It is, of course, best to study all three together, if good and reliable descriptions, pictures, and maps are available of the same locality, but we all need practice in the use of these 'tools' before we can get the best results from them, and before we can 'see' country from a description or map as a musician can 'hear' music from a score.

The work suggested in this book will, it is hoped, lead towards the mastery of these tools, and so perhaps to the better understanding of this difficult world, by helping young scholars to practise on a well-known district, and by learning there to use books, pictures, and maps to the best advantage, *with the test of first-hand observation at every step.*

It is well to study one's own country in detail, where developments may be noted which are taking place before our eyes. The whole world is changing more rapidly than at any period of history, and books and pictures soon become out of date. When considering conditions abroad, allowance must be made for this, and *dates* of publication should be noted. In the Home District, changes can be *seen*, between conditions shown in the descriptions, pictures, and maps of only a few years ago, and those of to-day, and young people are often much interested in accounts of recent changes and their effects on the life of the district. The comparison of old with contemporary maps (if an old map of the district is available) is valuable for the older scholars.

The course mapped out in this book is intended as a guide for those teachers and students to whom the subject and method are new, but there is unlimited scope for modification of the lessons by the teacher. Many suggestions given below will be found suitable for the older scholars only; others can be worked out with younger children. Some points will obviously be omitted, as not concerning the district in which the school lies, although in some such cases points might be mentioned for the purpose of comparison or contrast, or as illustrating some other district known to teacher or pupil. Doubtless, too, many features will be found on the local map which suggest other observations or problems not touched on here.

Ideally, in Secondary Schools of whatever type, copies of the 1-in. Ordnance Survey maps, and of the $\frac{1}{4}$ sheet of the 6-in. map in which the school is situated, should be provided for every two scholars, who could work in pairs. The Ordnance Survey Office, Chessington, supplies these at reduced prices for schools. Index sheets for each county, on scale of $\frac{1}{4}$ in. to 1 mile, can be obtained cheaply, and from these the 6-in. sheet can be chosen. If the price of so many maps for a class is prohibitive, it would be possible for one of each scale, or tracings made from it, to be shown on the wall, provided that it were possible for scholars to look carefully at details during or after the lesson, and for each scholar to make at least one tracing from this during the course. Excursions with the teacher *out of doors* are essential from time to time, but observations made out of school by the scholars, independently, are worth while, if the results are checked before being added to the school collection. Each scholar should have a note-book for observations, which may be advantageously illustrated by relevant photographs, drawings, sketch maps, and newspaper cuttings. The *sites* where geological specimens, significant plants, or buildings of special interest are found or seen, should be recorded on a 6-in. map for school use. But it should be borne in mind by both teacher and scholars that a set of detached observations, however accurate—and accuracy is essential—is not enough, unless these are used to build up a piece of work which is of value as a coherent whole. This piece of work, however, may take many years, and several generations of scholars, to complete! The fascination of such work, moreover, is not realized by either teacher or scholars until it is well under way.

It has been decided that this book, first published in 1934, should be reprinted in response to a persistent demand from teachers, in spite of the fact that other books on Local Survey methods have appeared meanwhile

—notably the new edition of ‘Local Studies’ published by the Geographical Association. As these recent publications should supplement rather than replace what is here written, it seems best to reprint this ‘Study of Local Geography’ with only minor alterations, including, however, a few which seem needed to distinguish certain conditions of the present from those of the recent past.

The Bibliography has been expanded to include a few recent books which should provide a background to local study in any district, but these general reference books should, of course, be supplemented by any available books, pamphlets or articles dealing with the special district. Many of these are mentioned in the very comprehensive list in the collection of ‘Local Studies’ by the Geographical Association. Others might be found in local libraries.

C. A. S.

**THE STUDY
OF LOCAL GEOGRAPHY**

CHAPTER I

THE STUDY OF LOCAL SCENERY

1. THE basis of a 'Local Survey' is *personal* exploration of a given district, but before a scholar can put himself in the position of an explorer, he must, of course, realize quite clearly his position in relation to the rest of the world. He should first find, in the school atlas, his own town or village, the nearest large river (noting its course), and the nearest range of hills, thus realizing in which region of the British Isles his explorations will take place. He should also note in which part of his *county* the home district lies. He should then be shown the local sheet of the 1-in. Ordnance Survey map. The relative *scales* of this map and of the map of England in the atlas should be discussed, and the boundaries of the former should as nearly as possible be traced on the latter. The position of the school should, as nearly as possible, be found on the 1-in. map, either by each scholar, or, if only one map is available, by the teacher. The map should then be 'set', or 'oriented', with the top of the paper pointing north, as it lies on the desk. This can be checked by what is known of the position of the sun at noon, or by the use of a compass. Certain towns, or natural features known to the scholars, should be found on the *1-in. map*, and the directions noted by pointing from the desk. Next, the position of the school should be found on the *6-in. map*. It will be marked as 'School', unless built since the map was published. (The date of publication and last revision of map should be looked at in the margin.) Scholars should 'set' the 6-in. map as it lies on the desk, find certain buildings well known to them—church, manor-house, town hall, post office, railway station, a farm, a mill, a bridge—draw pencil lines on the map from the school to these, and show true directions by pointing. Next estimate distances to these places 'as the crow flies' by means of the scale on the margin of the map, and note the routes by which they are reached by a good road or footpath.

From the outset of the work it is desirable that the scholars should be able to describe country accurately and in the correct terms, although simple language is preferable to technical where equally clear. But at this early stage scholars may well follow the advice given to Scouts by 'Gilcraft', in his handbook to '*Exploring*', and learn the meanings of the

terms there suggested, illustrating them by models or diagrams—for instance :

'*Bluff*: A low headland with perpendicular broad face.

'*Brow*: Part of a hill where the lower slopes become much steeper.

'*Crest*: Just before the actual summit of a hill or mountain, where the slope lessens.

'*Foot of a hill*: The slope rising from the plain to the brow.

'*Foothill*: One lying near the base of a mountain.

'*Knoll*: A small foothill.

'*Plateau*: An area of high level ground.

'*Ridge*: High ground connecting two hills or mountains,—in latter case sometimes called a "col" or "saddle".

'*Spur*: A projection from a mountain; short spurs are also called "shoulders" or "buttresses".

'*Undulating*: Ground that alternately rises and falls gently.'

Other terms will, of course, occur to the teacher as being specially applicable to the district studied, which can be directly illustrated from the local map, and, later, in the field.

Exercise 1. Scholars to show concisely and clearly how they could direct a stranger from the school to any point shown on the local map, (a) if he were on foot, (b) if he were cycling.

2. An excursion should, if possible, be made to some good viewpoint, and the class should there note the extent to which the country seen from it is included in, or covered by, the 1-in. and 6-in. maps respectively, when they are 'set'.¹ If a school excursion is not possible at this stage in the work, the scholars should be sent to some point independently, to report on what they see, and afterwards discuss the most *characteristic* features of the district—either coast or mountain or hill country, or flat fen-land, as the case may be. It should be considered critically, as seen by a stranger, in comparison with some other locality known to the teacher or children. After studying the view at first hand, and discussing what they have seen, the scholars should note where the Ordnance map shows streams (how many local streams are personally known?), woods, commons, marshes, and so on, and should learn the signs which denote them by studying the symbols

¹ The new 2½-in. map (1 : 25,000), where obtainable, is very useful.

in the margin of the map, or those in the Frontispiece. The distances of some of these features from the school should be measured by the scale and directions shown by pointing from the desk.

Scholars should note for what purpose the land in the district is chiefly used: mining?—agriculture?—pasture?—market gardening?—and whether these are carried on more in one part of the district than another, and find this region on the map. They should note factories and what they make, and how they are served by roads, canals and railways; also any new developments, new houses, or roads, since the map was published.

Exercise 2. Draw examples of all the Ordnance Survey signs used on local maps.

Exercise 3. Write a short account of the impressions of a visitor on seeing the district for the first time.

3. When beginning to solve the special problems of the locality it will be found that every Ordnance Survey map contains so much information that it is best to consider the different aspects of the country shown on it, separately, as well as in relation to one another. For this purpose a certain number of tracings of *special features* will be necessary. As *rivers and streams* are important features in the scenery of most districts and have counted so much in man's activities throughout history, it is well to consider them first. Very few sheets of the 6-in. map show *no* watercourses at all (if so there is probably some geographical reason for this, which is worth considering).

Different types of river valley are represented in Maps I, II, III, and V respectively. Scholars should note how the amount of surface water and the network of streams vary between one district and another, and *may* vary between country in different parts of the same map. The rivers in Maps I, II, III, and V (with contour lines, which will be considered later, and roads) have been traced from Ordnance Survey 6-in. maps. The 'patterns' made by watercourses on these differ much. *Map IV*, showing the sea coast, is almost without streams. In *Map I*, the main stream flowing from south to north, in places divides and so encloses 'islands', and takes one sharp bend. The small tributaries on its left bank and the smaller streams which feed them flow generally in straight courses. On the right bank of the main stream are two other tributaries, also flowing northwards, and one of these passes through a lake. On the left of the map,

westwards, is part of another stream, fed by some quite inconsiderable tributaries. The water-parting here would be easy to discover.

On Map II are heads of many diverging streams and the water-partings are more complicated. Some of the tributary valleys contain no streams—the dry valleys so often found in porous rock. In the north-west, rivulets carry water, it seems probable, to a larger stream in that direction. From the centre the most important-looking stream of the district flows away to the south-east. After several bends it is joined by a tributary on its right bank. Another tiny stream rises in the south of the district, and flows southwards. So several river sources and springs occur within the limits of this 6-in. map. How many scholars have had the opportunity to walk up a stream to its source, and how many have noticed whether the local river or stream rises in a marsh, or ditch, or as a spring on a hillside?

In *Map III* nearly all the water is on the left, or west of the map, and there is far more of it than there is on Maps I or II. The river divides into many branches, enclosing islands. Straight drainage ditches have altered the courses of some of these branches, but the water as a whole forms an intricate pattern, and water-partings would be hard to trace.

In *Map V* the two streams take, apparently, rather indefinite and arbitrary courses, a tributary joining the more westerly stream at an unusual angle.

In studying the network of streams in any district scholars should note whether the main roads tend to keep to the water-partings, or follow the valley bottoms, or tend to cross the rivers rather than follow their directions. The point up to which a river is navigable by pleasure- or cargo-boats should be noted, and also the positions of the former channels, now silted up.

Exercise 4. On the local 6-in. Ordnance map, draw all rivers, streams, ponds, and lakes in blue ink or crayon. On the map, the streams can be identified by the tiny arrows showing the direction of flow. Make a tracing, on transparent paper or linen, showing no other feature than surface water, and compare the 'pattern' thus obtained with the network on Maps I, II, III, and V. Mark navigable rivers and silted up channels distinctively.

4. In each of the districts considered above it will have been noticed that it is the character of the slope, or absence of slope, of the valley-sides which seems to have the most marked effect on the character of the scenery. This

can also be pointed out to children by means of selected photographs or drawings of country known to the teacher. In Maps I, II, III, and IV the differences between relief in what may be called mountain, hill, plateau, and flood-plain country are indicated by the *contour lines*, accompanied by figures. The scholars should note that although, of course, contours *could* be drawn to represent any continuous height above sea-level, some of our Ordnance Maps show them at intervals of 100 feet up to an altitude of 1,000 feet, and *above that* at intervals of 250 feet. This will explain why, although the higher slopes are usually steeper in mountain country than those below, the contour lines in Map I are nearer altogether on the *lower* slopes. Unless this point is borne in mind relief maps of mountain country are often misleading to beginners. The contour lines on Map I are more crowded than those of similar altitudes on Map II, for the latter represents a less steep and rugged district, and may be called 'hill' country. The contours on Map V are few in number, but tend to follow the coast, and indicate a 'plateau', falling abruptly to the sea. There are even fewer contours on Map III, where the country lies mainly between 180 feet and 300 feet, while the contour lines on Map V indicate hills to the north sinking abruptly to a coastal plain.

All these types of country, shown by contours, should be compared with that near the school, as shown by the local map, and the *gradients* should be examined, *taking into account the horizontal scale*, in each case. Any outstanding features shown by contours on the *local* 1-in. or 6-in. maps should, if possible be compared with photographs of local scenery.

Exercise 5. All contour lines on the local 6-in. map should be traced, in red ink or crayon, early in the course. The tracing of these can then be placed over, and compared with, the tracings of surface water already made in blue. (The boundaries of the sheet should be traced in each case, so that one can be placed accurately on the other. It is desirable, too, that the scale of the map and compass-bearings should be shown on each sheet, with the explanation of symbols used.) Scholars can then discover in which part of their home district the slopes are steepest, and can arrange to go and look at these examples, if possible taking a contour map with them.

5. It will be noted, on the local 6-in. map, that certain figures occur between the contour lines with the letters B.M. in front of them. These represent altitudes based on 'mean sea-level' (the point between high and

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low tide-marks at Newlyn, Cornwall.¹) The letters stand for 'Bench Mark'. In Map II they occur at intervals along a road running from west to east; also down the stream flowing south-west. As both road and stream also cross several contours, there are plenty of data for making 'profile' of these. (The altitudes should, in such an exercise, be considerably exaggerated.) The profile of the road would, moreover, indicate approximately a cross section of the valley.

The actual bench marks used in map-making can often be found on gate-posts or bridges or walls of houses, the sign $\overline{\text{M}}$ engraved in them, though often overgrown with vegetation. Scholars should note position and altitude, and compare these with positions of other bench marks where the site is visible.

Exercise 6. Scholars should find all bench marks on local map, and add figures to their tracings of contour lines. A cross section of the nearest valley, or profile of stream, should be made on graph paper, on a large scale. Details of gradient should, if possible, be sketched in from *personal observation* between the figures given on the map.

Sites of water-mills, working or disused, should be noted in connexion with any change in the gradient of the valley floor. If the locality is near the mouth of a river, note the point reached by high tide; if on, or near, a flood-plain, note levels to which water extends in flood-time.

6. Next, consider the *character* of the local streams in comparison with those shown on Maps I, II, III and V. Normally a river flows most swiftly near its source if it rises in mountain country, where, in its 'torrent track' after heavy rains or when snow melts, it can transport stones, gravel, and mud. Such a torrent is included on Map I, and can be seen to cross many contour lines. Scholars in such districts can note the times when such stream-beds are full of water, and when they are almost or completely dry, and so the gravel or stones which have been deposited during flood time can be seen. In the area covered by Map I such deposits are spread over the comparatively wide, flat, valley floor, shown where the contour lines keep right away from the river, and where the streams begin to meander on reaching a more nearly level surface. It may be pointed out that on the 6-in. map, from which Map I was traced, there are patches of special shading denoting the crags and precipices which contouring could not show; these should be looked for in maps of true mountain country.

¹ Sir C. Close: *The Map of England*.

It is possible to compare the profiles of the streams shown respectively on Maps I, II and V, if reduced to the same scale, and if the vertical scale is exaggerated proportionately in each. Certain characteristics of these three rivers should be noted, and afterwards compared or contrasted with those of the nearest local stream. The profile of this last should be reduced to the same scale as that of the examples given.

In Map III the gradient of the river's bed is so slight that it spreads into many branches, drowns the neighbouring fields in floodtime, and deposits, after every flood, a thin deposit of silt or alluvium, thus building up a flood-plain while deepening its bed upstream.

No boats can be used on the tiny streams in Map II, but in times past the one flowing south-westwards supplied power for several mills.

A stream on Map I is the most normal, having its steepest fall near its source. But there is a distinct break in the gradient where the stream reaches a comparatively level surface. It has, so far, not been able to grade its bed into the smooth curve of the 'ideal' river profile. The contours on Map I show how it dashes down a very steep valley-side to join a larger river on a wider, nearly flat valley floor. More even, though very slight, curves are made by profiles of streams in Map II, and the gradients are sometimes almost imperceptibly, steeper near the head, so that the curves are also slightly concave. This would be shown if the drawing were on a large scale. The profile of the stream on Map V, however, in its short course to the sea, shows a curve which appears to be *very* slightly convex. It is unusual in having its slightest gradient near its source—its fall becoming progressively steeper as it approaches the sea, until it falls steeply over the edge of the plateau on which it rises. Nowhere has it excavated such a deep valley as that occupied by stream No. 2. This type of curve, with a nearly level upper course, steepening towards its outlet, is even more marked in a neighbouring river. The sources of these streams are significant. Map I shews a true mountain rill. Streams on II flow from springs on the valley-sides. Those on Map V rise in tracts of marsh or moor.

These watercourses owe their characteristic features to the land over which they flow, and to the extent to which they have been able to influence the topography of the district. This is largely determined by rock-structure, as will appear on further investigation. In the case of a town survey the character of a river can sometimes be deduced from a view from a bridge. Windings can sometimes be seen, and differences in the slopes of the land

on either side may give some idea of the scenery before the district was covered by buildings. The character of the river-banks, too, whether natural or artificial, will show what measures have been taken to guard against floods, and notes could be made on the tracing accordingly.

Exercise 7. Cross sections and profiles should be made of the valleys in Maps I, II, III, and V, or from other maps selected by the teacher, using contour lines and other available figures. Note which valleys are most nearly V-shaped and which might be called U-shaped. Compare these with local valleys, and study the shapes of these in the field.

CHAPTER II

OBSERVATIONS ON THE EARTH'S CRUST

1. WHEN some of the necessary 'tools' in the shape of maps, sections, and observations are ready, it is possible to attack some of the problems connected with local scenery. At this point it is well to consider the actual materials of which the earth's crust is made, which so largely account for differences between different districts. To find out the character of these local 'rocks', as we shall call them, whether hard or soft, even the younger scholars should notice as much as possible for themselves. The land in ploughed fields may be reddish, brown, or grey; the roads, where not tarred, may be yellow or white; but the 'explorers' should realize that the surface has almost everywhere been weathered into 'soil', and they should try to find out what is beneath. Near the sea rocks may be exposed on the face of a *cliff*—hard and craggy, as in Cornwall; white, as in parts of Kent and Sussex; or sandy, as in Norfolk. Rocks of different colours may even be seen one above another. Inland, *quarries* may show the rock beneath the surface soil: slate in Wales or Cumberland, limestone in Yorkshire or Gloucestershire, granite in Cornwall or Devon. If a road is being levelled or widened through hilly country a *section* is visible before vegetation covers it. In some districts, however, scholars must be content with a geological section showing what has been observed in a shaft sunk in connexion with water-works or some factory; copies of these can sometimes be obtained for reference. A school in London, where the surface was entirely covered by clay, could do little beyond noting the low altitude of the surface in comparison with the level of the river-bed and the railways raised up upon embankments, but in a town there is an opportunity when the foundations of a new house are being dug or drains being laid; in the country, when a well is being sunk. It should be noted whether different strata lie one above another horizontally, or are folded or dip gently in one main direction.

Scholars should realize that rocks were not all made at once, but are, all the time, being built up in some places and worn down in others—that 'Earth Sculpture', as we may call it, goes on continuously by many different processes. Rain, running water, frost, wind, the roots of plants, the burrowings of animals, all play a part in it. But they should realize, too, that

nearly all rocks—except material from recent volcanic eruptions, the soft gravel and mud along the banks of rivers, and the actual surface soil—are far older than human history. Those called sedimentary rocks, including sands and sandstones, clays, limestone, were deposited by different processes *under water* at the mouth of a large river, in a lake, under the sea. Just as, in a cutting or quarry, the older ones will be found below the more recent, so, in the *key* to any geological map which shows the rocks of different periods, the names are placed in *order of age*, starting at the bottom of the list. This should always be done when drawing any geological map, however simple, and it saves much confusion if the same colours are always used for rocks of the same periods. Geological history (inconceivably long though it is), has, for purposes of study, been divided into ‘eras’, and these into ‘periods’, during which climate, distribution of land and water, and the forms of living creatures changed many times. Although the length of these periods is not known, the order in which they occurred and the rocks which were formed in them, and certain facts about the conditions under which these rocks were formed, can be verified by means of the *fossil remains* of the life of those times. It should be made clear to scholars that man is generally considered to have appeared on the earth during the most recent period shown in the key to most geological maps.

Exercise 8. Older scholars could colour lightly, in paint or crayon, the divisions on a geological map. Use colours suggested by the key to the geological map in school atlas.¹ Note the periods represented by rocks in the neighbourhood of the school. Make some comparisons, as to hill and plain country, between a geological and physical map of England.

2. Knowledge of the positions of rocks of some of the chief geological periods (including those in which chalk, various clays, or limestones chiefly occur) will give the older scholars some clue to the differences in *scenery* between various districts. They should realize that, in general, the greatest contrasts are found between some districts in north and west Britain with those in the south and east. Apart from the fact that, on the whole, hills are higher and the climate is wetter in the north and west, there is a characteristic look of ‘wildness’ there, even in country bordering industrial towns, holiday resorts, and mining villages, largely due to the *hard rock* so often seen protruding through the moorland vegetation or grass there. The

¹ Inexpensive outline geological maps can be obtained, to be coloured by hand, e.g. the ‘Map of the British Isles, with Geological Boundaries for use of students’. T. Murby & Co.

influences of human activities and history are more obvious in the south, where the land, even in remote country districts, has been cultivated for centuries, and this, largely, is a question of soil and climate.

'Sedimentary rocks,' classified under the periods of their formation, occur over the greater part of England. When travelling westwards or north-westwards from London one passes over successively older rocks. The rocks of the district illustrated in Map II were formed in the Jurassic period (named from contemporary rocks in the Jura mountains), and are mainly limestone—a fact of immense importance for various aspects of the life of the district, including water-supply.

The flood-plain shown in Map III is on clay, of a later formation in the Jurassic period.

North and west of these districts are sedimentary rocks which are much lower in the scale of geological time and are immeasurably old. Some, formed during very early periods, are found in the district, which includes country shown in Map I.

On the keys to most geological maps there are certain divisions which do *not* represent sedimentary rocks, and are marked by different signs. They are usually placed at the bottom of the list, but are not *necessarily* older than all the rest, though some are immensely old. They were formed differently from sedimentary rocks, and include those known as 'igneous'. Such are some of the hard rocks of the country in Map V. Igneous rocks were formed in such intense heat that the materials of which they were made became molten under the earth's surface. If they cooled sufficiently slowly, underground, for the separate materials in them to become crystals (such as can be seen in granite, for example) they are classed as 'crystalline', or 'plutonic' rocks. The southernmost cliffs in Map V are made of granite. There are many kinds of crystalline rocks, but, of whatever materials they are made, their presence on the surface of the earth to-day proves that the vast coverings of rock under which they cooled must have been removed during long ages of denudation. But if this once molten rock escaped through the crater of a volcano, or a rift in the earth's crust, it would cool too quickly to form crystals, and is known as 'volcanic' rock. (This, of course, is also igneous.)

These rocks are very hard. So, too, are those (often formed as sedimentary rocks) which have become *changed* in character in various ways, such as by pressure, folding, or the influence of heat. Such altered rocks

are called 'metamorphic', and include clays which have become slates, limestones which have become marble, and so on. They are often found, naturally, in the neighbourhood of igneous rocks (in some cases having been altered by the heat of these, when in a molten condition), so in mountain districts granite and slate are often near together. These occur side by side on the coast in Map V. Scholars can easily understand that no fossil remains of *living creatures* can be expected in igneous rocks, but the *crystals* of which they are formed often produce 'precious' and 'semi-precious' stones, and on the beaches shown on Map V various forms of quartz, such as topaz, amethyst, and agate can be picked up, as the granite near by has been broken up by weathering.

Valuable minerals, too, are often found in cracks or 'veins' of metamorphic rocks, so such districts tend to be mining areas; and existing or disused workings or shafts should be looked for on local maps of such regions, and visited when possible, with the local geological map. Mines and quarries for hard building-stone or road metal often occur in districts of fine rugged scenery, and the swift streams which one would expect to find there are often put to good use.

It is difficult for children to understand the influence of rocks on landscape or industry if no sections are visible, but they can be told how the nature of the local rock can be deduced, with experience, from other evidence, such as the behaviour of watercourses, the shapes of hills and valleys, the position of springs, and the character of the vegetation. But the beginner should not attempt to draw hasty conclusions from such clues without further evidence.

Exercise 9. Scholars should find, on their local map, any quarries, pits, or cuttings there shown and visit as many as possible. They should describe the appearance of the rock there, the direction of 'dip' (if any) of the strata, and bring back specimens of either fossils or crystals if they can do so, *noting and marking the place where these were found.* If fossils are found, what do they suggest with regard to the times in which the creatures lived? In the case of a quarry, what use is made of the rock worked in it?

3. Perhaps the best place for the study of rock structure in connexion with scenery is a sea coast where the rocks are sufficiently resistant to form cliffs, providing a ready-made section to show the effects of erosion, and, in some districts, of folding, and occasionally the results of movements (rising or sinking) of the land surface.

Map V shows such a coast made of hard, igneous rock. We have already noted, from the contours, that there is a decided drop to the sea here, although the cliffs are not, actually, very high. In the south of the area, where granite, which forms the greater part of the plateau, reaches the coast, its outline is jagged. Seen from the shore, this country shows a smoothly flowing, nearly level sky-line. Such gentle curves are often characteristic of granite country. Even in the mountainous districts of the Scottish highlands granite often produces lumpy, rounded forms rather than sharp peaks, owing to the manner in which it weathers. The crystals of various kinds which it contains are not all acted upon by rain at equal rates—some are dissolved, or crumble away more quickly than others, and the rock thus breaks up. When the debris is washed away the resulting land forms depend on the angles of the joints in the remaining rock. If these are not regularly vertical or horizontal, indefinite, convex forms result, as on the sky-line of the district in Map V. Occasionally, however, jointing is such that the rock weathers into blocks or pillars (on cliffs or mountain-sides), or steep cliffs, which, when eroded back, leave behind columns or 'stacks' forming, eventually, little islands off the shore. The well-known pictures of Land's End show granite of this type, and the entrance to a cave on the coast shown in Map V, shows such characteristic jointing.

In this district the beach beneath the cliffs is narrow, and towards the south of the map almost disappears, indicating only a small area between high and low tide mark. A steep shelving shore, here strewn with large rounded boulders mingled with patches of shingle, contains pebbles of great variety. The probable source of such pebbles, and how far they correspond with the cliffs behind, or from which direction they may have been brought by long shore-currents, is an interesting problem for those who live near the sea, and leads on to questions such as the blocking of river-mouths by shingle or the preservation of low-lying coasts by means of groynes.

Map IV shows a very different type of coast. The outstanding contrasts with Map V are its smooth coast-line, the absence of any streams worthy of the name, and of any contour lines near the sea. Also the nearly rectangular lay-out of the roads near the coast, indicating absence of natural obstacles, may be noted. This network of roads is still extending farther westward. Much of the land, marshy until recently drained, is below beach-level. It forms a low plain between upstanding chalk hills and the sea,

and would be rapidly encroached on if not protected from the waves by a barrier of shingle. But this same shingle would be carried away if not artificially checked in its turn. The sea-wall which had been built along part of the shore proved insufficient to keep back the shingle, so, during the last century, 'groynes' which run from the shore out to sea beyond high-tide mark, were made of planks attached to fir poles driven into the beach. "The groynes are spaced at distances varying from 40 to 160 yards apart, the top being originally 3 to 4 feet above the beach. They are placed in a south-east direction at an angle of from 110 to 120 degrees from the shore-line. At the upper part of the beach, on the west side of the pier, for a width of about 60 feet, the shingle has accumulated nearly to the top of the sea-wall, and many of the old groynes are buried. The shingle tails down nearly to the end of the groynes the lower end being 18 feet lower down than the sea-wall. The shingle varies from 2 to 5 feet higher on the west than on the east side of the groyne.

'At the time these groynes were put down the beach had become quite bare of shingle, and the land was being destroyed by the action of the waves. Since their construction a fine beach has accumulated all along this part of the coast, which affords adequate protection to the sea-wall and road. Although these groynes have answered the purpose for which they were intended, in raising the beach near the sea-wall, they were not carried far enough down towards low water. As the beach between half-tide and low water is very low and flat, the inclination being at the rate of 1 in 300, the water is unable to drain off quickly; the sand is seldom hard and dry, and seaweed collects in the lows in great quantities.'¹

Children who have seen such groynes on visits to various parts of the coast, and perhaps remember sitting or bathing in the shelter of them, will be able to realize the direction of the prevailing drift which piled the shingle higher on one side than on the other.

Sand-dunes raise problems of rather different kinds, with much scope for observation and the additional interest of the typical vegetation which grows on them, and its uses in checking the encroachment of the sand blown by prevailing winds on to the adjacent countryside. In each case the relief, or absence of relief, of the coast land should be taken into consideration, and how far this is due to the actual materials—hard or soft—of which it is made.

¹ W. H. Wheeler: *The Sea Coast*.

On rocky coasts such as that shown in Map V, the drift of shingle is stopped by small rocky spurs or irregularities, sometimes separated by little bays in which shingle accumulates. Such irregularities may have been first caused by inequalities in the hardness of the rock acted upon by both waves and weather, and the head of a bay often marks the place where a band of less resistant rock reaches the coast, for 'sea erosion is horizontal and leaves headlands; rain erosion is vertical and leaves hills; along the coast the harder rocks stand out, inland they stand up.'¹

(Scholars should bear in mind, too, that just as most 'river-work' is done in times of flood so wave erosion is almost entirely accomplished in times of storm.)

The shallow bay, occupied by a fishing-village at the mouth of the stream in Map V, marks the end of a band of old 'sedimentary rock' which here reaches the coast, and which, at its edges, has been changed to 'metamorphic rock' by the neighbouring granite on the south, and by a volcanic rock known as 'greenstone' on the north. In addition to the eventful and complicated geological history implied by *the mere presence* of these rocks, we find that their presence in these *relative positions* has not only so influenced the coast-line as to give rise to a little sheltered inlet here but also to have controlled a river valley which is steeper, and deeper, 'near its mouth than upstream'. The vague turnings of the little streams on Map V and the unusual angle at which a tributary joins a larger river may be due to the slope of the plateau being too slight to send the flow of water in any definite direction. The directions may have first been taken owing to small irregularities in the surface due to erosion along the joints of the foundation rock, which gradually deepened. The cross sections of the valleys, like the surface of the plateau, show gentle curves, and are shallow troughs at the bottom of which the streams wind gently from their sources in flat moors or bogs, until they approach the steeper gradient near the sea.

And here later events in geological history are evidenced by a fragment of old sea beach, about 50 feet above present sea-level, resting on the 'greenstone'. The line of this old beach, formed when the land surface was lower than now, forms a ledge on the shelving face of the cliff, used by the present coast road. On the rocky, irregular coast-line, which includes that shown in Map V, we read² that it owes its origin to a subsidence which occurred before the Great Ice Age, when for a time the land was even lower than it is

¹ Lord Avebury: *The Scenery of England*.

² E. M. Ward: *English Coastal Evolution*.

to-day. During this period a beach was formed, and there are signs that the coast-line was then even more irregular than it is now. Then, long afterwards, the land was raised to some extent out of the sea, bringing the old shore-line up to the level of the ledge followed by the present road. The plain, then laid bare at sea-level was afterwards eroded and encroached on by the sea; but remains of the forest which grew on it can be seen at exceptionally low tides, not far away.

So, in an area of a few square miles only, may be found evidences of stupendous changes, almost beyond our full comprehension, which took place during long past ages, but which have left *results* which affect the inhabitants of such localities to-day in ways which will be considered in connexion with town and village sites. Such problems are beyond the scope of younger children unless very clear evidence can be seen personally, and if explanation is attempted, the 1-in. map of the district should be used in addition to the 6-in. as a rule. But in the case of older scholars, the *results* of many such events and processes in geological history can be shown to a class, and if connected with recent or present developments of the district will add much to their interest. Children can realize that, 'as a rule, when the land is sinking the water is relatively deep and drowned valleys make the coast irregular and complicated, while, on the other hand, when the land is rising, the water is shallow, the shore shelving and simple, because the form of the sea bottom is smoother and with less abrupt changes than that of the land',¹ and so understand that more is involved in the formation of capes and inlets than the erosion of hard or soft rock respectively. In such work the local 'Memoir' of the Geological Survey, written to accompany the local geological map, will be of great use to the *teacher*. Although, in the main, too technical for the class, there is usually much general information about the district, including the industries and water-supply dependent on geological formations.

Exercise 10. Discuss any coasts which may have been seen by scholars, and arrange a school visit to any within reach. Find out, from a geological map, of what they are made. Note whether beach is shingly or sandy, steep or flat, and try to discover directions of currents and of the prevailing winds. Examine photographs of typical coasts and find out of what they are made. If the school is inland a comparison of photographs collected during holidays would be helpful.

4. We have seen how, in some districts, the coast is not able to resist

¹ Lord Avebury: *Scenery of England*.

rapid erosion, and is low enough to be overwhelmed by drifting shingle or sand if these are not artificially checked, and children will realize that for the most part this happens where rocks are comparatively 'soft', although it should be made clear that there are districts where hard metamorphic rocks have been worn down (owing to their great age) to a lowland, while even soft sands form low cliffs in others. Perhaps the most interesting and effective coastal scenery is that in which the actual foldings which have taken place can be seen in the rocks themselves, as in the neighbourhood of 'The Lizard' (where the turned-up schists form jagged outlines differing much from the granite blocks and columns of Land's End), or amongst the hard 'sedimentary' rocks near Lulworth Cove. Such a coast does help towards the realization of 'mountain building', if the inconceivable length of geological time is sufficiently stressed. But in a 'local survey' such observations should not be separated from their bearing in human life: how far a coast of this kind is good or bad for the fishing industry, the position of the nearest life-boat station, the area from which the nearest lighthouse can be seen by day, and its light at night, and so on.

In other parts of the coast cliffs lend themselves (as in south-east Devon or the Isle of Wight) to the direct observation of several types of 'sedimentary' rock of different colours and powers of resistance, lying one over another. These, in places, have given rise to 'land-slides', which have remodelled the coast and altered the course of the roads sometimes within the memory of man.

This brings us to the consideration of differing powers of resistance to erosion of different rocks. Children naturally think of those rocks which are '*hard*' standing up as hills, or projecting as headlands, and of so-called '*soft*' rocks being worn down to lowlands or receding as bays. But the matter is not always as simple as that, because 'resistant' rocks are not *always* very hard. In central and southern England especially the positions and shapes of the hills and valleys largely depend on the extent to which the rocks are *porous*. Much of the rain which falls on sand, or limestone, or chalk, sinks into the ground instead of remaining entirely on the surface, and the rock after a rainy season becomes saturated underground like a sponge, although the surface, bearing few streams is not easily worn down. In the same way coastal erosion is hastened by *land-slides* where porous rock lies on impervious clays which dip towards the sea. In such cases land-slides occur after seasons of heavy rain, when the porous rock has become water-logged.

(The position of such an occurrence should be marked on a local map and the area affected should be noted. Land-slides, of course, are not confined to sea coasts, but occur on hillsides where favoured by the dip of porous rocks on impervious ones, and have in some districts caused much damage during the making of tunnels and railway cuttings.)

5. Apart from causing land-slides, the relative positions of pervious and impervious rocks are of great importance in the study of many districts, on formations like sand, or chalk, or limestone. Inland the relative porosity of neighbouring rocks has much effect on scenery.

In the area of Map II, the slopes of the valley-sides are not equally steep from top to bottom, and cross-sections of the valleys would show differences in gradient where are exposed the limestones, clays and sands found in the district. These different kinds of rock lie one above another and have been cut through in succession down to the valley bottom (all were formed in the Jurassic period). The artificial lake has been made where the valley bottom is of clay. But each is affected differently by erosion, and so the valley-sides sink in varying curves, the steepest slopes being on porous rocks; for porous rocks often give rise to convex slopes and impervious ones (such as clay) to concave slopes, and this may be used as further evidence towards deducing the nature of the rock. Sometimes, when rock is porous, water trickles away to a considerable depth, and if it is cracked and jointed, as in the case of certain limestones, the rock itself may, under certain conditions, be dissolved by the percolating water, and underground stream-courses, occasionally widening out into caves, may be formed. These are found in the limestones of the Pennine and Mendip country. In the later limestones of the Cotswolds, and in chalk, are many valleys with no water in them. Sometimes these are dry at all seasons, sometimes water appears in them after a rainy spell only. These intermittent streams are called 'Bournes' in chalk districts. The contour lines on Map IV show that a valley containing no stream cuts through the hill country towards the north of the map, and is used by a road. The hills are of chalk, and the dry valley is one of those known as a 'windgap', but children should be warned not to assume that these were made by the wind!

Many important results arise from the fact that water, which sinks into a porous rock and reaches an impervious clay floor, causes the overlying strata to become *saturated*. *Springs* flow out at or above the level of

the clay, and are often the sources of streams. This occurs in the district shown on Map II. Note where springs emerge on the valley sides.

Clay is made up of smaller grains than those of sand or of many limestones (so small that they fit closely together and form a smooth paste when wet). Rain-water, when fallen, remains on the surface, and we say that such land does not 'dry up' quickly after a shower. There is usually a dense network of surface streams in clay country, such as that on Map III, and these streams, after wet weather, tend to flood their banks. In clay country, too, are many ponds, whereas in districts on porous rocks these are scarcer, or have to be made artificially. On clay country, ditches called 'moats' were sometimes made and were needed to drain off the water. Knowledge of rocks is necessary for the understanding of water-supplies for the inhabitants of any district and their live-stock. Villages, farms and hamlets shewn on Map II have grown up near springs at the head or sides of valleys.

Exercise 11. Make a tracing from the local 6-in. map showing all springs, pumps, or wells (adding the depths in feet where known), ponds, reservoirs, and the areas where streams flood their banks in wet seasons. Find out the character of the rock in these localities and indicate this on the map. Look at these places personally and note the surface and slopes of the land near by. Note whether, and to what extent, porous rock forms convex, and impervious rock forms concave, slopes on the hillsides.

Exercise 12. If the 1-in. map of the district near the school includes areas of pervious and impervious rock, trace, in contrast, the network of streams found on each.

CHAPTER III

SOME TYPES OF COUNTRY

1. **ESCARPMENTS.** Certain districts are influenced, more apparently than others, by geological conditions. Mountain and fen districts are obviously some of these. In addition to these, amongst those regions which owe their distinctive character to events in geological history, are those bands of upland country (familiar to most scholars as seen in school atlases), which occur in the Midlands and south-east of England.

An elementary knowledge of map-reading will tell scholars that these are steeper on one side than on the other, and they should be able to suggest how this fact could be represented on large-scale maps by means of contour lines. They should also discuss the probable *appearance* of such country, whether the scarp is seen from above or from below. Pictures of scarp-lands might be collected and discussed. If any escarpment, of whatever altitude, is within reach it should be visited and examined, together with the view seen from it, with a 1-in. map.

If Map II can be shown to the class (either enlarged or by means of an epidiascope) scholars should note where the *scarp edge* is indicated by contours. This is part of the escarpment (mainly formed of limestone, merging below into sand, and lying above clay) which crosses the Midlands, from south-west to north-east. *In detail* it varies much in direction and in altitude, indicated by the curved contour lines facing west. The Midland scarp-lands, as well as those in south-east England, are due to a series of sedimentary rocks of varying resistance, but for the most part tilted in the same direction and acted upon by erosion. Children will note that the uplands are formed of the more resistant rocks—here, it so happens, resistant *because porous*. Such rocks (limestone and chalk) are less easily worn down than are the impervious clays on which they rest, and which are exposed in the intervening lowlands. For, *just because* water cannot well sink into clay (we all know how slowly clay dries after rain), its *surface* is carried away by streams and the trickling of water over it.

Map II also shows where the streams rise (as springs) near the base of the scarp, thrown out by the clay below; they flow, approximately, north-westwards to join a large river some way beyond the western margin of the map.

Note that springs occur at approximately the same altitudes in this district—in some cases flowing copiously out of a valley-side as a stream of water, or in others collected in wells for village use, or in some cases oozing gently out of the ground and forming a patch of swamp surrounded by reeds, horse-tails, and other moisture-loving plants. Sometimes a valley-head is marked by damp ground and reeds, *above* the actual source of the stream at that time, showing where water emerges after a rainy season when the ground is saturated to a higher level. Scholars should realize that in porous rock the height of the ground-water, or 'water-table', varies greatly according to the season. This accounts for some of the intermittent streams, or 'bournes', in chalk country. If these occur near the school the dates and places of their appearance and times of their disappearance should be noted and compared with the rainfall records.

When a spring flows out of a hillside, in such a district as that shewn in Map II, it may make a little hollow or cave into which soil falls from above, and the little gully thus eats its way back into the hillside. This process leads to what is known as 'headward erosion' of valleys, which increase their length upstream and sometimes tap or 'capture' other rivers and divert them from a higher level. This headward growth is difficult for children to understand when merely explained by diagrams and not seen in action, and if a spring which is actually taking part in the process can be visited it should help much.

Sources of streams on Map II give a clue to the *irregular line* of a scarp, and show that bays may be formed where streams rise, sometimes aided by the weakening of the rock by faulting. Snow, too, gathers in northward-facing combs, lingers there longer than elsewhere, and its melting assists erosion.

Irregularity in the rate of the wearing back of the scarp face has further consequences, for spurs, like that shown on the south-west of Map II, are left projecting between the bays and may eventually become nearly, or completely, detached from the escarpment, standing like islands in front of it. They are then called 'outliers', and are naturally made of the materials of the escarpment behind them, although in some cases the uppermost strata have been removed, and their shapes are affected accordingly. Scholars might try to imagine where the spur shown in the south-west of Map II will eventually be separated from the main mass.

If any escarpment is within reach of the school it will afford unlimited scope for personal observation, not only with regard to the view from its crest and the character of the rocks laid bare in quarries or cuttings, or shown by the position of springs, but also in connexion with aspects of 'human geography', such as the probable *differences* in cultivation, sites of settlements, types of buildings, and the general appearance of the countryside between the top of the escarpment and the country at its foot.

Even the younger children could discuss the *appearance* of a spring and other types of sources of rivers, and all should consider if there is a likelihood of a well-marked spring-line in the home district. For this problem, and for the contrasting types of country suggested above, it is not the *height* of the scarp, but its *structure*, which is important.

If a large town has grown up near the foot of a scarp near by, note whether there is a *gap*, which forms a natural route leading to it across the escarpment.

Exercise 13. Draw a map of imaginary country, showing, by contour lines, an escarpment with outliers in different stages of formation, and mark positions of springs.

Exercise 14. Write an account, with sketch map, of the water-supply of the local village, town, or suburb. If town water has recently been 'laid on' describe both old and new sources of supply. How is the water-supply affected by local geology?

2. **GLACIATION.**—Having attempted to look for certain characteristics of rock-structure and their effects on the prevailing conditions of the countryside, scholars in the North and Midlands might now try to find evidences of a period in geological history which has left very marked traces—that known as the 'Great Ice Age'. Glaciers, 'abroad', will doubtless have been dealt with in geography lessons, and children will be familiar with the terms 'snow-field', 'moraine', 'erratic rocks', and so on, but these will gain in interest if traces of them can be found near home. Maps and photographs give only slight indications of the results of glaciation, but even these are helpful if *compared with what can be seen at first hand*. With experience, it is possible to recognize country which has once been glaciated. Scholars should realize that in late geological times, corresponding, approximately, to the beginnings of human history (or rather 'pre-history') and after the existing hills and valleys were for the most part blocked out.

much of the more detailed modelling was done by ice in the North and Midlands of England and most of Northern Europe. On the outskirts of these regions (and within them too) the land surface was subsequently acted on and modified by the vast floods which occurred when the climate became warm enough for much of this ice to melt. Indirect results followed from these events, which have greatly influenced human life in such regions.

The processes which occurred can be more easily understood if it is realized that much 'earth sculpture' is still being done by ice, such as when the water which has penetrated rock crevices expands and splits off fragments to form 'scree' on mountain-sides. These show clearly in photographs and even town children could compare such ice action with that which causes 'burst pipes' at home! The land-forms resulting from such frost action depend upon the kind of jointing in the particular rock acted upon. Ice-work is responsible for many of the sharp, needle-like peaks in mountain districts, and also for the destruction of stone walls made of limestone, which split easily into thin flakes; frost is actually made use of in the making of 'Cotswold tiles', which are left out in winter for the frost to separate the slabs when quarried.

But how can one tell whether a district was once under arctic conditions? It must be remembered that the 'Great Ice Age' occupied an immense period of time, and that there were many changes of climate within this period, during which the ice alternately advanced over the lowlands and retreated to the uplands, filling the mountain valleys with glaciers. In parts of England, signs of all stages of glaciation can be found (a) when the main part of Britain was a continuous field of ice and snow; (b) when there were ice-fields still, but a good deal of ground was uncovered for part of the year; (c) when most of the land was free from perpetual snow and glaciers remained only in the valleys.¹ Contrast either of these periods with the state of affairs to-day, when only a few of our hill districts are snow-covered for short periods in winter and snow is very rarely seen in summer! Perhaps the most easily recognized signs are those of the third stage.

It is easy to imagine a valley such as that in Map I filled, or nearly filled, with a glacier! It has been often pointed out that the cross section of a glaciated valley assumes a U rather than a V form, and that 'tributary valleys lose contact with the more rapidly deepening floor of the main

¹ Mary Johnstone: *Elements of Geology*.

valley beneath the glacier, so that when the glacier finally disappears, tributaries overhang.¹ Map I indicates the U shape by means of contours, and in its north-east corner there is a clear example of a 'hanging valley', a steep fall terminating a comparatively level upper reach of the river and causing it to descend by a striking waterfall.

It is thought that the chief erosive power of glaciers, as they move slowly and weightily over the rock beneath is to smooth the surface by means of stones which have fallen into crevasses and become wedged into the ice below, acting as a carpenter's plane. Some such polished rocks in the bed of a former glacier retain the actual scratches made by these stones, showing the direction in which the ice moved. An excellent example of such a rock is close to the bridge in Map I, between village and stream. Such valleys were carved out by water before the Ice Age, but their *shapes* were modified by ice-work. Often the smooth, rounded shapes of the lower valley slopes contrast with more jagged shapes above. Note on Map I the almost parallel contour lines on either side of the valley, which indicate its comparatively flat, wide, floor—wide enough for some cultivation and for a road to follow the stream at almost stream level—a frequent feature of glaciated country.

Certain relics of glaciation, recognizable in the field, cannot be shown on a small-scale map. But when *in* such country scholars could try to recognize boulders which may have been brought from a distance and deposited on the hillsides, and observe whether they are made of a rock which is different from that on which they lie, and so whether they can be considered 'erratic' rocks. On the ridge towards the west of Map I 'boulders of volcanic rock are found resting on Skiddaw Slates at the summit of Maiden Moor, on the top of the ridge between Derwentwater and Newlands Valley, at a height of 1,887 feet. This hill is half a mile north of the nearest outcrop of the volcanic rocks. From thence they are traceable all along the ridge to the top of Cat Bells, so that the ice here reached the ridge summit. . . . Some of the ice from Borrowdale must have escaped over the ridge into Newlands Valley'.²

But movements of materials are still going on, and in many U-shaped valleys heaps of debris are still being deposited by streams or waterfalls as they reach the comparatively flat valley floor from its steep sides, and examples of old moraines may be found which temporarily held back a lake

¹ C. C. Carter: *Landforms and Life*.

² J. E. Marr: *Geology of the Lake District*.

and have produced alluvial flats behind them. Deltas, too, can be observed in process of formation where a stream flows into the head of a lake and deposits alluvium, and often provides some of the most fertile soil in the district, which has encouraged the growth of a village near by.

Exercise 15. Describe any evidences of former glaciation to be seen near the school, or in any district visited during holidays, or in a good picture of glaciated country. Consider how these results affect human life in the district.

Exercise 16. Draw a contour map of an imaginary valley showing evidences of glaciation.

3. Although comparatively few schools are situated in hill or mountain country made of hard rock, where results of ice-work can be easily seen, the less direct effects of the 'Great Ice Age' are more widespread, and of very great importance for mankind. Such are the sheets and patches of 'Glacial Drift' which were spread over the lowlands in northern England and throughout the Midlands by the vast floods which occurred when the climate became warmer, and which also, perhaps, carried southwards blocks of floating ice. These drifts, varying in thickness, spread above the older rocks shown in the ordinary sheets of the geological survey maps. The 'drifts' have not been mapped completely, though special 'drift maps' have been made for certain districts. Where they occur they can be recognized as including a mixture of materials, some of which have obviously been brought from a distance. Drifts may be either clay, with pebbles in it, gravel (sometimes made of pebbles and fragments of very different sizes), or sand, and it is obvious that, where present, they largely control the character of the soil, making it sometimes more, sometimes less fertile than it would otherwise be. So, when considering either the undulations often found on the low-lying Midland plains (which may be due to heaped-up drift gravel), or water-supply (which may come from shallow wells sunk in 'drift' above a clay floor), or agriculture, or wild plant life, it is important to know whether 'drift' occurs above the rocks shown on the geological map, and, if possible, its thickness in the locality studied. In some districts the presence of drift adds to the difficulty of local studies, but it also adds interest to what otherwise would be considered rather dull country, and helps to explain many difficult problems. If children can picture Northern Europe under arctic conditions, and the floods, bearing masses of ice with

soils and rock fragments embedded in it which resulted, they will be interested in collecting as large a variety as possible of the materials strewn over the neighbouring fields in the form of gravel or 'boulder clay'. If possible these should be identified by an expert (perhaps the curator of a museum), who would say from which direction they came. The local 'Memoir' of the Geological Survey might give some information about them. The 'glacial drift' must not be looked for south of the Thames, as its presence there is very problematical.

Perhaps the most widespread of the glacial deposits is that called 'boulder clay' (the result of the ground moraine of the great ice sheet), usually stiff, grey clay with stones of various sizes and sometimes sand in it. 'Drift' is sometimes deep enough to form cliffs, where cut off by the sea, as on parts of the east coast. In certain villages of the Midlands it is used to make walls for gardens and sheds, and even some of the older cottages; and stones showing scratches made by ice can be found in such walls. Boulder clay or gravels containing materials brought from so many sources¹ would be likely to form good fertile soil, as indeed it often does. On the Yorkshire coast, for instance, twenty or thirty varieties of travelled rocks can be found,² brought from various directions and distances.

Other gravels, also known to geologists as 'superficial deposits' are widespread, and found also in south England, laid down in comparatively recent geological times. Some occur at the foot of the escarpment in Map II and in similar country, and are due to the denudation and down-wash of the scarp face. They made dry sites for villages, and held shallow wells, and occasionally made good foundations for ancient roads, above the impervious clay floor on which they are often found. Other gravel deposits are often found at intervals along the banks of rivers (the Thames, Severn, and others), and account for the sites of many riverside towns and villages.³ These deposits mark the periods when the rivers were much larger and had more carrying power than now, and laid down, in flood time, sheets of gravel, sand, and clay along their banks, in the times of Paleolithic man and of the animals which he hunted. It is in such gravels that the tools of early man and bones of many animals, now extinct, are often found. Patches of such gravels intermittently border the river shown in Map III, and until lately the growth of many riverside towns has been limited to the area on

¹ Wright: *The Great Ice Age*.

² Mary A. Johnstone: *Elements of Geology*.

³ C. A. Simpson: *Rediscovering England*.

which these occur. Recent possibilities of drainage are now breaking down such geological limitations. Patches of gravel still, however, often raise villages just above flood-level.

If possible scholars should be shown a cutting or pit where either glacial or river deposits can be seen, and a visit arranged to a local museum to see any relics of human or animal life which may have been found in them.

Exercise 17. Look for any evidences of such 'superficial' deposits in the district, and plot their positions on the local 6-in. map. Make a collection of pebbles found in them. Study the contours of the country and the shapes of valleys where they occur. Inquire as to old methods of water-supply in such districts, and to what extent the use of shallow wells in such gravels has been replaced by water from a reservoir.

CHAPTER IV

CLIMATE

THE foregoing suggestions for a few, out of the many, possible subjects for study in the district near the school have perhaps shown how even a slight knowledge of local rocks will serve as a foundation for the understanding of conditions of human life in past and present times. The connexion between them varies with every district, but everywhere rock-formations control the *relief* of the country, and this, in its turn, contributes largely, though perhaps indirectly, to another important factor in the life of man, namely *climate*.

Scholars will, of course, be familiar with the general temperature and rainfall maps of the British Isles, but these give little information about the actual climate in any one spot in an area known to children. The *average* figures, worked out for long periods, and covering regions of such a size that they can be shown on small-scale maps, mean less to children, and to many adults, too, than do the daily fluctuations which must be expected in this climate. These fluctuations, moreover, differ enormously (if the physical environment is different) in small districts only a few miles apart. How 'local' such climatic conditions may be, even when worked out on a five years' average, was shown in a recent paper,¹ in which figures were given for two farms in Wales, a few miles apart only; but one was two miles from the sea, at 400 feet in altitude, the other 10 miles inland and just under 1,000 feet.

'The rainfall at 1,000 feet is 10% higher than at 400 feet.

'The sunshine at 1,000 feet is 8% lower than at 400 feet.

'The grass minimum temperature at 1,000 feet is 4.4° lower than at 400 feet.

'The 4-in. soil temperature at 1,000 feet is 2° lower than at 400 feet.'

The author then points out that 'these figures serve to show the increasing soggyiness as we get more and more into the hills, while of course there are large areas where the rainfall exceeds 60 ins. and not inconsiderable pockets where it exceeds 100 ins.'

¹ R. G. Stapledon: 'Climate and the Improvement of Hill Land.' *Geography*, March, 1933.

How far can the complicated conditions giving rise to local climate be grasped by scholars and related to those conditions producing the large areas covered by the 'prevailing westerly winds' and 'equable temperatures' of the text-books? Children do not always fully grasp the fact of the *variability* of the climate in such regions (the fact that westerly and south-westerly winds often give place to others) just because cyclones and anti-cyclones are so difficult for them to understand. Again, although most scholars realize, theoretically, the differences between the climates of the east and west coasts of Britain, and perhaps between the uplands and lowlands, the more local variations due to *relief* and *aspect* are less often taken into account. And yet these are extremely important in rural life, and perhaps can be best made 'real' to scholars when studied in relation to other aspects of the region.

Many schools keep careful records of temperature, rainfall, and direction of wind, and these might suggest more 'live' problems if they are, at frequent intervals, discussed in connexion with the local survey—the results of local 'weather' on what can be seen in the locality.

Then, too, local observations and records, however comprehensive, gain in interest and meaning if compared with those made in some other district. If those taken daily are compared, while the conditions are still remembered, with those recorded in London, or some other station of which the site is well known, the contrasts and differences will be enlightening. Perhaps two schools, not far apart but differently situated as to altitude and exposure, could from time to time exchange records for discussion, while *averages* worked out from these might be compared with those from stations abroad.

Schools situated in hill country can find contrasts in climate close at hand. For instance, although normally temperatures decrease with altitude, the problem of 'inversion of temperature' may occur when cold, heavy air sinks down into a valley, producing frosts and cold nights, while the hillslopes above are comparatively warm. Although, ideally, these temperatures should be tested by thermometers at different altitudes, the *results* can be noted by observing their effects on garden produce, and when it comes to perfection at the respective sites, or when promising crops are spoiled by frosts. The effect of the aspect of steep slopes on snow is often striking—where it first begins to 'lie' and where it remains longest. Still more important, though perhaps less obvious, are effects of the aspect of the chief topographical features, and the prevailing winds, *on local rainfall*.

In big towns the direction of wind is easily and often disagreeably obvious from the direction of the smoke from industrial districts, and thus is easily observed by scholars; and in many towns the position of the larger and more expensive houses in relation to the direction of the prevailing wind, and in consequence smoke, is significant. So, too, is the position of many health resorts (as that in Map IV) which have grown up in the shelter of hills which screen them from north or east winds.

Some results from the prevailing rain-bearing winds, to be seen facing the direction whence they come, are shown on *buildings* in towns. It has been pointed out¹ that in London, for instance, one can 'study the doings of the rain-bearing south-west wind all over the town, how it puts its own high lights on London, touching the Portland stone with silver, and spots the plane trees with gold'. Mr. Bone tells us how 'Portland Stone', of which some of the chief London buildings are made, 'decays by powdering off in a uniform way, so that its surface continues flat,' for it soon gathers 'a crust of dirt which greys down its first delicate lemon tinge, after it has accumulated a certain quantity of the crust, comes off by its own weight, and the air then plays on the clean stone, which has already had a certain weathering, and the surface gradually whitens to the ashen colour that is the beauty of London'. Different kinds of rock weather differently after being used for building, and so observant students in large towns can notice how 'the smoke and wayward directions of the wind, buffeted in confined irregular streets . . . are other features in the complexion of the town. The weathering of stone is affected by hundreds of chances, the arrangements and accidents of the drips, the quality of the jointing and bedding when tested by the rain, the flatness of the surface and the eccentricities of small mouldings as well as the prevailing rain-bearing wind that whitens projections and cleans every surface on which it has free play.'

So the actual character of the stone, affected as it is by weather, is largely responsible for the fact, pointed out by Mr. Bone that 'the look of London is so different from that of other cities. Manchester buildings are a uniform rich black, with a delicate surface, as of adhering textile fluff, so that on some days it seems a velvet city, with black velvet buildings and white velvet clocks. Glasgow buildings darken quickly into a hard morose quality, with smoke quietly about them. Edinburgh is a grey city, its Craighleith stone and method of working reflecting little light but deepening its tall

¹ James Bone: *The London Perambulator*.

dignity. Liverpool has Portland Stone, but its atmosphere does not whiten or darken it, as London does.¹

In country districts, processes of weathering in the direction of rain-bearing winds can be observed on the walls of new cottages. The speed at which this takes place is very marked in the Cotswolds, where so many houses are built of 'Oolite' limestone. The *sheltered* positions occupied by most of the older houses is noteworthy too, and so is the direction of the growth of trees in exposed positions in many districts—the branches growing away from the direction of the prevailing winds. This is very conspicuous on the wind-swept plateau shown in Map V.

A collection of *local* weather proverbs has been made in connexion with some 'surveys', and this is worth while if these are related to weather conditions brought about by the *features of the locality*.

Exercise 18. Describe any features of the district near the school which may influence local weather, comparing them with some other district of a different character.

Compare records of temperature, rainfall, and directions of wind, made daily at the school, with a corresponding series of weather charts for the British Isles, cut out of a daily newspaper, and the averages of these with averages of records made simultaneously by another school, if possible at a different altitude or with a different aspect.

Note the following points *as they occur*, entering them on a special map, 6 in. to 1 mile, or on a tracing to be placed over this : The extent to which excessive rain affected the volume of the nearest river (the area flooded might be mapped), and the time elapsing between the rains and the greatest extent of the floods ; which plants (and in which gardens) were killed by late frosts; (compare the positions and altitudes and aspects of the more fortunate gardens), the places where snow lingered longest after a heavy fall, and whether this was due to aspect or to cold soil; which slopes dry most quickly after heavy rain; at what temperature heavy dews appear near the school; and at what altitude mist or fog was most prevalent; the most usual direction taken by smoke from the nearest town; or the most suitable spot in which to make a bonfire. Dates of any such occurrences should be marked on the map.

¹ James Bone: *The London Perambulator*.

CHAPTER V

VEGETATION

THE study of local vegetation will have most meaning for scholars if carried on in a district where outstanding differences are to be found between two areas within it. Failing this, local conditions should be compared with descriptions of country of a different type elsewhere, and photographs shown. In country where a lowland is bordered by a scarp defining a plateau, for instance, great differences in climate, and often consequently in vegetation, may be found, especially if the soil differs with the relief. Map II includes country where, in addition to the consequences of variations in altitude, the differences between plants which do and do not like *lime* in the soil are well marked. Such lime-loving plants as the orchis, rock-rose, scabious, wild clematis are confined to the higher altitudes, and extensive beech-woods cover the summit of the limestone escarpment, where the prevailing winds deposit more rain than is received even by the upland surface farther east, where trees are scarce. Northwards and westwards, on the low-lying clay vale, beeches almost disappear, and oaks, elms, orchards, and meadows fringed by hedgerows prevail. Garden produce, moreover, is several weeks earlier in spring on the lowland to the north than on the plateau.

A still greater contrast would be found if the vegetation on any part of Map II were compared with that of the district covered by Map I, where the steep hillsides are covered by rough grass (through which project greenish-grey boulders), much bracken, and clusters of ferns in the rock crevices. On the opposite side of the valley a little heather clings to the rocks, above woods of oak, ash, and birch. There is little cultivation on the alluvial flats, which are mainly meadows merging into heathland and bog, with patches of reeds.

Different again are the treeless, wind-swept gorse-covered 'moors', amongst the little fields of pasture, on the gently undulating granite plateau in Map V, where the characteristic cultivation (of early vegetables and flowers) is carried on on the more sheltered slopes above the sea.

Older scholars can learn to distinguish the chief types of vegetation with relation to the kind of district in which they may be expected.¹ Deciduous and coniferous woods, heaths, peat-bogs and sand-dunes, riverside

¹ Mary Johnstone: *Plant Ecology*.

meadows, for instance, can be marked on the local map if and where they occur. Beech-woods, with their scarcity of undergrowth, which are so frequently found on chalk or limestone, and which form dense leafy canopies shutting out light in summer and covering the ground with a thick carpet of leaves lasting through the winter, may be distinguished from oak-woods, often found on clay soil, more open above, and which allow of more varied and tangled undergrowth. The typical vegetation found respectively on marshy soil above clay, on peat, on sand (giving rise to a certain type of heath sometimes), in the alluvium of flood-plains, on chalk downs, should be alluded to by the teacher for comparison with what is seen near home. Any neighbouring regions with such outstanding types should be marked on a tracing to be placed over the local 6-in. map. The characteristic plants forming the hedgerows in different parts of the district should be noted. So, too, should the plant-life round a spring (reeds, horse-tails, and so forth), with the distance above and around the spring to which such vegetation extends. The indications of moorland vegetation on the boggy areas where streams well out of the granite plateau in Map V may be noted.

In such work as this it is more valuable, surely, for children to note and map the distribution of *prevailing* plants than to collect rare specimens; and incidentally, this method lessens the risk of the extermination of rare plants by over-zealous collectors! Drawings of the commoner plants found in different localities would give scope to children whose bent lies in that direction. Collections of *pressed* flowers are only relevant to a survey if notes are made on the *prevalence of certain varieties* in certain localities, and suggestions made to account for this. Specimens should be classified according to their abundance or rarity, and 'plant communities'—those which tend to grow well together—should be noticed. An example of what can be done in the observation of plants under unpromising circumstances has been shown in a School Survey (by boys of ten to thirteen) in East London.¹ The boy who contributed this special study added the note that "The collecting area is very limited, being confined to a short section of the Banks of the Northern Outfall Sewer, Back Yards and Front Gardens in general. (A photograph of the bank of the sewer is included in the 'survey'.) The *wild* flowers which he found there he has classified as 'very abundant' (18 varieties), 'common' (24), and 'rare' (22). All these are named in the list. Another boy has made a plan of '220 yards in a busy street' near to a leather-

¹ Manor Road School, Stratford, E.15.

cloth factory; the trees in such 'yards' being marked by name on the plan, and include elder, plane, poplar, ash, fig, pear, silver birch, sycamore, lime.

If such work can be done in a busy London street, what may not be achieved by studying vegetation with relation to its environment in more rural districts? In these, beyond the collecting and noting distributions of local plants, *new* developments with regard to plant-life should be observed and mapped; for example, to show how quickly disused quarries and waste lands become clothed with vegetation, and what are the first plants to appear there. In a case recently shown to the writer willow-herb had, within a year, covered a 'dump' of old tins and rubbish in a pit where only grass had grown previously. Town children as well as those in the country sometimes have the chance of such observations, where buildings are cleared away and the land lies waste for a time.

In a rural school 'every effort was made to give reality to the geological map by pressing ploughmen, roadmakers and farmers, as well as the children themselves, into co-operation, to collect different kinds of soils. These samples were brought to school and studied and seeds planted in them to study the effect of soil on development'; moreover, at this school 'a lad who was backward because of his former truancy was put in charge of records of wild nature and soon became comparatively expert at mapping finds'.¹

Many observations are possible in either 'town' or 'country' districts. For instance, scholars could note what kind of trees are most easily blown down after a storm and the character of the roots exposed. It can often be seen, too, in quarries or cuttings that tree-roots both disintegrate and hold together the soil. The work of disintegration and of destruction brought about by burrowing animals should also be considered, and the localities where those burrowings (rabbit warrens and so forth) are found. These also might be mapped. So, too, should the positions of former waste lands now built on or cultivated and of ancient forests now cleared, where reliable information is obtainable.

Exercise 19. Find and mark on the local 6-in. map any regions of distinctive vegetation, using Ordnance Survey symbols where possible. Visit these areas with the map. Make drawings of some typical plants from each, selecting those which give character to each region. Trace, from local map, the positions where they are most abundant, and study these in connexion with soil and local climate. Illustrate notes by photographs.

¹ Experiment described in *Geography*, June 1930, p. 488.

CHAPTER VI

AGRICULTURE

THE agriculture of the local district has been studied, often very thoroughly, by many schools, in connexion with contributions towards the 'Land Utilisation Map of Great Britain',¹ but there is always scope for fresh observation. In addition to the fact that the filling in of a map of local fields with notes as to their uses is a good introduction to map-reading and to methods of 'survey' in general, such maps, made during a series of years, are useful in showing the rotation of crops used in the district, and for recording the dates of other changes which may have taken place. But in this, as well as in other aspects of the survey, the study is more valuable if differences between one district and another can be observed. Scholars are fortunate if their home district is one in which such differences (in topography, climate, and vegetation) can be found near at hand. In the country covered by Map I heather, bracken, short grass, interspersed with bogs are found on the heights where soil is thin and where sheep roam, while meadows, a few cultivated fields and gardens can exist on the flat, alluvial and sheltered valley floor. Snow sometimes covers the heights in winter when the northward-facing valley may be free from it, if sheltered from the snow-bearing wind.

In Map III the branching river is, naturally, bordered by meadows, and any cultivation must occur at altitudes safe from floods. (This problem is also important in limiting the growth of the town near by and controlling its shape.)

The absence of marked topographical features on the coastal plain in Map IV has made possible the rectangular layout of many new roads (a few of which follow the courses of old country lanes) which have spread out from a large seaside resort, and this same growth of the town is largely due to its exceptionally sheltered position south of a range of 'downs'.

The sheltered climate, good mixed soil, and a high average of sunshine have led to market-gardening on a large scale here, particularly under glass.

Market-gardening of a different type is carried on along the coast shown

¹ Information as to this can be obtained from the office of The Land Utilisation Survey of Britain.

in Map V. Here the steeply shelving cliffs are terraced by tiny fields of early flowering bulbs, the produce being sent early in the year to London and elsewhere. Daffodils, tulips, narcissi, and anemones are grown here, besides early vegetables. The warm, equable climate allows flowers to appear early; the cliffs face the western sun and are sheltered from the strongest winds, and seaweed has for long been a convenient and fertile manure. The map of this district on its unreduced scale of 6 in. to a mile can show the very small sizes of these coastal bulb-fields, as compared with those of the meadows on the plateau inland, and the still larger fields shown on 6-in. maps of the Midland counties. The fringe of these 'gardens' along the coast seems to indicate the importance, even in this mild climate, of *shelter* from the prevailing south-west winds, for the plateau surface is bare and almost treeless, given up to meadows divided by earth-banks supported by stone walls, and interspersed, near the sources of streams, with patches of marsh or rough scrub where gorse and bracken flourish. Grass and arable land both occur in the country covered by Map II, and their distribution can still, to a certain extent, be related to the respective exposures of limestone, sand and clay here.

In addition to the actual uses to which the land is put to-day, and the changes which may be found to have taken place (in clay country, for instance, 'many of the fields still show ridges of "lands" in which, when they grew wheat, they were laid up to let the water away'),¹ the nature of the *field boundaries* and fences is worth consideration, as to how far they are determined by local needs and possibilities. Compare the stone walls of the Cumberland hills of old, hard, slaty rock, or of the old limestone of the Pennines, or of the rather less old limestones of the Cotswolds, with the hedges of the low-lying Midland districts--those clay districts where 'the land is not, and never was, very valuable. The roads are wide, and on either side have wide, waste strips cut up roughly by horse-tracks, cart-ruts, and ant hills. Bracken, gorse, rushes, thistles, and brambles grow there.'² How many of these wide strips of green have been removed for the adaptation of roads to motor-traffic within the memory of teacher or scholars? The hedges in such country are tall and thick and trailing, and in summer provide welcome shade for the horses and cattle in the fields. But on soils where agriculture can be carried on more successfully the hedges are closely trimmed, or the fields bounded by wire fences so that no

¹ Sir John Russell: *Lessons on Soil*.

² *Ibid.*

sunlight is lost; the lanes are narrow, and often, in the sandy districts, sunk between high banks.

Different districts have different types of *stiles and gates*, too, and drawings of these might be made for purposes of comparison with other districts where the 'old-fashioned' designs are still used.

The collection of old *field-names* from those who remember them (for they are fast being forgotten in many districts) makes a link with local history, and if these are filled in on a tracing of field boundaries, and this placed over a geological map, obvious reasons for many of them may be traced.

In these days, even more than of old, positions of *markets* are an essential part of the study of all rural industry, and consideration should be given to the *destination* of what is produced. A diagram might be drawn with arrows pointing in the directions of markets for different kinds of produce,¹ with notes as to their distance. The best routes to such markets, and the replacement of former by contemporary market towns might be traced from the local 1-in. map or the atlas. The arrangements for quick transport of perishable commodities, such as milk, fruit, flowers, or fish, might be shown in this connexion.

Exercise 20. Make a map showing the land utilization of the district on the scale of 6 in. to a mile. Colour, differently, the land used for arable, permanent grass, woodland, common, orchards. Write name of crop in each field, and *date* the map when finished. If the map shows large areas of bog, heath, woodland, hill pasture, water-meadows, compare with geological map, bearing in mind that the presence of glacial or river *drift*, above the older geological formations shown on the map, may have a marked effect on vegetation.

Exercise 21. Make a map indicating, in different colours, the nature of the field boundaries.

¹ This was done by a school in Oxfordshire, the work being described in *Village Survey Making* (Educational Pamphlet No. 61).

CHAPTER VII

INDUSTRIES

THE making of a map to illustrate local farming leads on to the consideration of other industries, the sites of which may already have been entered on a 'Land Utilisation' map. 'Industries' may be considered from different standpoints, and of course vary with each locality. Many districts include those 'rural' industries which are carried on near the sources of the raw material. Mining and quarrying have already been referred to in connexion with the local geological map, and mining, it should be pointed out, in itself often gives rise to urban conditions around it. As in the study of agricultural products, the *uses* made of these raw materials and the destinations to which they are sent should be discussed with the class. Then in many rural districts there are 'woodland industries', such as the cutting of timber, the making of hurdles, ladders, and hop-poles, the gathering of faggots, the making of baskets from osiers, and so on.¹ Many of these, of long standing (and sometimes dating from a time when the village had to be nearly self-supporting), are, for various reasons, dying out in many localities, or have come to an end in recent years, though much timber-felling has taken place recently, notably along the scarp edge in Map II. Water mills, which formerly ground flour for local needs may have been demolished or converted to other uses. An ancient mine shaft is to be found in Map I and the remains of two windmills in Map IV. Note whether these are related to their geographical environment. The reasons for the dying out of local industries in certain localities lead back to many aspects of local history, and records of these should be collected and their sites mapped before it is too late. Others still flourish, and all are worth study in relation to their surroundings and the means of transport of their products in the past and present.

To a rural school 'grandmother sent her gloving needle, with a square point to penetrate the leather. This led to a discussion of the days when gloves were made by hand from local deer-skin obtained from the now vanished forest and to much searching in records to find out how far present-day blacksmith and hurdle-maker could trace back family records of

¹ H. FitzRandolph: *The Rural Industries of England and Wales*.

occupation.¹ There, too, 'children in July watch the sheep-shearer at his work, weigh the fleece of one animal, watch the load start off, to the stapler at Charlbury. Then back to school to look up all that can be found about the woollen industry past and present with the concrete picture of what a fleece is, what it weighs, what it means in effort to procure it and export it.'²

Industries have lately been introduced into rural districts either by artist craftsmen who employ a few villagers, or by factories which have migrated from a town or set up in the country on account of lower rents or some new facilities for transport. Such developments usually mean that new buildings have sprung up since the publication of the local map, and it is good practice for the older scholars to insert these in it. In the case of factories, the *sources* of the materials which are used should be considered, as well as the destination of the finished products, and the means by which they are transported.

Visitors often ask what is the chief 'occupation' of a town or village, and children should not make too sweeping statements about this, or consider that only one trade is important. A school in a very small village³ mapped every house, and coloured it according to the occupation of the householder. These were classified as farmers, farm-workers, those who make things, those who carry things, those who sell things, rectory and manor-house. Many methods of classification will suggest themselves, according to the locality.

In towns the problems connected with industries are more complicated, and often more difficult to relate to a 'geographical background', and the products of factories may be very varied even close to the school. A London school⁴ has made a diagram showing the evidences of industry which can be seen from the schoolroom window, by means of radiating lines pointing in the directions of factory chimneys, with their proportionate distances worked out from the map. The types of industry were classified in different colours, and a photograph was taken from the same window showing the positions of the chimneys.

A map was also made on which the sites of these factories were traced. This school made separate maps for various aspects of industry—one for factories; one for local markets, storage yards for coal, timber, building materials, with photographs of work in progress; one for shops, classified as

¹ Experiment described in *Geography*, June 1930, p. 488.

² *Ibid.*

³ Idbury, Oxfordshire.

⁴ Manor Road School, Stratford, E.15.

selling foodstuffs, clothing, hardware, tea-shops; one for places of amusement (also giving employment); one for places of worship and education. If such maps are traced on transparent paper or linen and placed over physical maps on the same scale, certain problems might arise for discussion, such as the kind of site chosen for various kinds of industry with regard to facilities for transport by river, road, or canal, and so forth. Communications in their turn are very directly controlled by geographical conditions.

Another London school links up local occupations (those connected with the London Docks near by) with the geography of the outside world in an original way. The boys collect labels from foreign match-boxes, which are mounted to show whence the sailors come. Such a collection if carefully checked by an atlas, would fix the localities of many place-names abroad in the children's minds. These boys take it in turns, each week, to mark on a map of the world *all the ports* from which vessels are due in the docks, as given in the *Stratford Express*. In addition to learning the location of some of the world's ports the boy is having practice in using the index of an Atlas.

The colliery names on coal wagons in a railway coal-yard near the school were noted, and these collieries marked on a map of England.

Changes in the work done in the same factory within living memory might be interesting and significant.

Exercise 22. The industries of the locality should be studied by different scholars, each producing a map to show the site of the special industry chosen, with notes as to the source of raw materials, the uses to which they are put, and the destination of the production, with further notes on what can be discovered about the history of the particular industry.

Exercise 23. Maps might either be traced from the local map, to show distribution of factories and workshops, with distance from wharf and railway station, or sketched from what can be found in the school atlas as to distance from sources of supply or power.

In the case of a village, the sources of supplies for village shop and other facilities for obtaining provisions, might be indicated.

CHAPTER VIII

TRANSPORT AND COMMUNICATION

THE study of local industry inevitably leads to that of the means of transport of the commodities used or produced, some of which may be seen from the school window or in the immediate locality. In this connexion a map of local *markets* for industries other than agriculture might be made, showing the routes leading to them, or a chart in diagrammatic form indicating their directions and distances.

Tracings should be made from the local 6-in. map of all roads, railways, and canals there shown. Children could try to compare what could be seen of these with their positions as shown on the map, and to verify on it the turnings, corners, and crossings of these. They should be visited *with* a sketch map if possible.

The direct relationship of a school to the local routes was shown in a map made by London scholars,¹ marking the best routes to the railway station, nearest fire-alarm and doctor, while a sketch map of a larger area, traced from a 1-in. Ordnance map, showed local branches of the railway with the school area as a centre and positions of the railway stations near it.

In the work of older scholars the aim should be to relate routes to their 'geographical background'. For example, in Map I the main road runs close by the stream, along the valley bottom. The contours show that this is made possible by the U-shaped section of the valley itself, and this, in its turn, brings us back to the results of glaciation. In Map II, on the other hand, no road follows the banks of the stream. For here the land-forms (deeply cut, narrow valleys which have, in places, reached a clay floor, the sides broken by projecting spurs) tend to drive the roads on to intervening uplands. Here, then, main roads tend to *cross* streams nearly at right angles, leaving the low ground as soon as possible. The sharp bends in the road on the north-west of the map indicate the difficulty experienced in descending the scarp face.

On Map V the coast road, on the east of the map, has taken advantage of a ledge formed by the 'raised beach' alluded to on p. 16, but it passes inland towards the south, where the ledge is no longer evident. On Map III

¹ Manor Road School, Stratford, E.15.

the roads have to keep well away from the river, owing to its tendency to flood.

In areas where main roads, canals, and railways are all shown on the same local map the types of route chosen by each (to avoid gradients where possible in the cases of canals and railways, and to avoid former marshes in the case of roads, for example) afford interesting subjects of comparison, if the contours are studied. It will be found, however, that the local 6-in. map should in this study be supplemented by one showing a larger area.

The study of routes can be approached from many angles, according to the opportunities in the locality, and the *periods* during which the various means of communication originated or were most in use should be taken into consideration. In a rural school¹ a view of the site of an old Cistercian abbey led to 'a conversation about the relation of the abbey to the sheep-rearing and woollen industry, and about the pack-horses of long ago, with contrasts of transport to-day.' A map distinguishing the older pack-horse lanes (in which that district abounds) from the motor-roads used to-day, could be made to illustrate such a talk, and would introduce further problems, such as the subject of prehistoric trackways and the tumuli which so often mark these routes. This will lead to discussion on the *sites* of these, and their presence, most frequently, on uplands of porous rock.

In many localities the study of roads and trackways is bound up with that of local history and pre-history. Although it is dangerous to jump to conclusions too hastily, and even children can realize that such information is open to question, several types of prehistoric trackways are recognizable in certain districts. The ridgeways followed the crest of hills, such as the scarp of the Wiltshire and Berkshire downs, avoiding the formerly marshy and forested area of the plain below and keeping clear of river crossings where possible. Hillside roads sometimes run parallel to these at lower levels and were made as the forests were cleared, but still keep above the heads of streams which flow from the scarp face, and now, in some districts join up a line of villages which have grown up near these springs. Some slight knowledge of the local rocks will therefore add interest here.² Then, deeply embedded by trampling of cattle through long ages there are the 'hollow ways', which run between high banks from the hills into the valleys.

¹ See *Geography*, June 1930, p. 489.

² A good example is that of the ridgeway following the crest of the Berkshire downs, with the Icknield Way below it.

Roman Roads are found in many localities,¹ but their significance is to a great extent lost unless the local section is considered in connexion with the road as a whole, and unless its course is considered in relation to its use during the Roman occupation of Britain, and the geography of the country which it traverses. The fact that some Roman roads followed the lines of previously existing trackways should not be forgotten.

The names of inns on a main road may tell something of the age of the stage-coach, or even earlier times, and sites of coaching inns, toll-gates, and bridges should be marked on a road-map. In rural areas notes should be made as to whether footpaths are rights of way; this involves personal observation and 'research', as Ordnance Survey maps do not show this. Incidentally, such a map made by scholars would of some practical use to residents and visitors to the district.

It has been suggested to Scouts² that 'a systematic Survey should be made of every reputed path in the area under investigation and a careful record made of all stiles and gates, foot-bridges, gaps, hurdles, posts, and other facilities for passage', and that 'when a path has been repaired a note should be made of the circumstances and particulars given as to the person or local authority by whom the repairs were executed all notices applying to the use of the path should be carefully copied and where the path has been ploughed the fact should be stated'.

A tracing from the local O.S. map should distinguish the roads used for motor-bus services, and could be elaborated to include alterations due to the increasing motor-traffic, such as the rounding of corners, the easing of gradients, and, of course, any by-pass roads which may have been made since the publication of the map, with date of construction. In such cases the road which has been superseded is often a winding one, and the *causes* of such windings may be interesting geographically or geologically, as well as historically.

In towns, clues to old roads, their origins or chief uses are sometimes given by street-names. Near an east London school are 'Abbey Road', 'Manor Road,' 'Pond Road,' 'Crows Road,' indicating the character of the district long ago. A Battersea street called 'Green Lane' was true to its name within living memory. In another London district a scholar found and noted the many streets named after historical personages, thus showing their probable dates. In some towns these would indicate the stages of growth in the town, and

¹ See Ordnance Survey Map of Roman Britain.

² *Exploring*, by 'Gilcraft'.

perhaps might be considered in connexion with the architecture of the houses. One London school had a fortunate opportunity for first-hand study of former means of transport. From the school window could be seen the towering masts of the *Archibald Russell*—the famous Finnish-owned four-master which won the grain race in 1929. The fact that the boys could sometimes 'see the men at work furling and unfurling the sails though nearly a mile away, raised much interest in wind-jammers, and this led directly to such geographical work as the routes followed by sailing vessels, the planetary wind system, the cargo from Australia, and so on'.

In large towns, however, there is usually more opportunity for noting the *uses made* of communications in the present or immediate past than in the earlier periods of their history, and changes can be observed which are taking place even within school memory. In East London a diagram was made, on graph paper, showing the percentage of motor, horse, and bicycle traffic past the school between 9 and 10 a.m. Such graphs would be of great interest if made over a series of years. At the same school local transport was considered in connexion with conditions beyond the immediate neighbourhood, by means of a list of commercial vehicles seen passing the school. The list included name of owner, description of goods, and name of town whence they came. Such names might well be plotted on a map of England, supplemented by a world map, for the goods included timber, sawdust, oil, stones, tar, candles, bottles, acid, meat, flower-pots, poultry food, beer, tyres, tins, raw cotton, soap, petrol, vegetables, sulphur. What an introduction to the 'economic geography' of pre-war days, to be compared with that of the present day.

And what opportunities there are in some districts for scholars to take note of contemporary changes by observing developments of flying, studied in connexion with the air routes of the world. The coming of an aerodrome or an aircraft factory to the district, and dates connected with its development, would be of interest to future generations of scholars, as well as being a fascinating study for the present one, and, again, a good starting-point for the study of world geography. But here, too, any geographical reasons for the presence of such activities *in that particular place* should be discovered if possible.

Exercise 24. Make a tracing from the local 6-in. map of all communications shown on it, distinguishing railway, roads, and canals in different colours. If the district affords the opportunity, older scholars might make two maps of these, one classified historically, showing, even if only approximately, the periods of their

origin or when they were chiefly in use, and one showing their uses at the present time. In each case the sections shown on the local map should be looked at side by side with a map of a larger area. There would also be scope for study of gradients, and this too would link up the historical work with the physical geography of the district.

CHAPTER IX

THE SITES OF TOWNS AND VILLAGES

It is obvious that the study of routes is closely connected with that of the centres from which they diverge or through which they pass, and an important aspect of all survey work is the consideration of the *site* of any human settlement in the district, and whether this is due to its presence on an important route or not. The reasons for any particular site vary as much as do those for the course of any particular road; they can nearly always be related more or less directly to geographical environment, even if this does not tell the whole story.

Just as rivers, contours, and roads can be traced from the Ordnance Survey map and placed over other features for comparison, so a tracing of buildings, indicated by tiny spots on the 1-in. scale, and by the general shapes of the buildings on the 6-in. scale, can be made and placed over tracings of physical features. In this way certain outstanding reasons for the origin and growth of a town or village in that particular position come to light. In addition to the clusters of houses which denote a town, the distribution of smaller groups, or isolated buildings, their presence in any quantity, or their absence from certain localities should be noted. For instance, in Map II there is a notable absence of buildings towards the east of the map, in the district (indicated by contour lines as an upland) where a geological map would show a limestone surface, and where surface water is absent, but note how the main roads keep to the comparatively flat plateau surface.

Dwellers in most localities very often take such matters for granted until questions arise which concern new building schemes or the preservation of a 'beauty spot'; but children may well be asked to consider *why* their town or village has grown up just where it stands, and how far the conditions of its origin still hold good. Sites of other towns and villages, known to the scholars at first hand or by hearsay, should be compared with it. For instance, if the school is in a town which is at the uppermost point reached, in times past, by ships on a tidal river, or where the river is crossed by a road of importance long ago, they should note how far such conditions have changed, and the sites of former importance should be visited with the

teacher, and looked at on the local map if possible. The scholars should note how almost every town of historic importance is on a river which was once navigable, and some of these towns should be found in the school atlas. Scholars should consider whether those country towns or villages (if known to them) which have grown recently into big industrial centres have done so through the presence, near by, of some raw material or source of power, or of railway facilities which have attracted factories there. Villages, too, may have become 'holiday resorts' by reason of the beauty of their scenery, the mildness of their climate, the character of the coast, or facilities for sport or amusement. Map IV shows part of the site of a 'sea-side' town, facing south, with sheltering hills behind a flat coastal plain. This last is being covered, increasingly with a network of roads, some of which have grown out of old 'lanes', others recently planned. Since the publication of the map these have spread almost up to the hills, unrestricted by topographical features, now that much marshy ground has been drained.

In contrast with this 'spreading' sea-side resort the old fishing-village in Map V is confined within the sheltering rim of the little bay at the mouth of a tiny stream, which, as we have already noted, falls most steeply in its lower course. Its branches are carried along gutters bordering the streets, in which the water flows with great force. The little harbour into which it flows is artificially enclosed by two quays, and is sheltered from south-west winds. The older houses are crowded together below the 100-foot contour, and are likewise sheltered. The indentation of the coast-line in which this village grew up, shallow though it is, represents the end of a band of weaker rock dividing an extensive area of granite on the west and south from a mass of volcanic 'greenstone' on the north-east. Thus the unequal rates of erosion on rocks of differing resistance, by producing such bays, has been of use to man since the beginning of history—not only by providing shelter, but also by causing the accumulation of shingly beaches where fishing-boats could be landed or driftwood collected. Again such beaches, in addition to protecting the interior of some districts from the attacks of waves or submergence, provide fertilizers of limy shell-sands or of the seaweed cast up on them.¹ This last occurs in the district of Map V, where, both north and south of the village, the upper slopes of the cliffs are cut up into tiny rectangular fields, terraced between low walls, where vegetables and early flowering bulbs (narcissis, daffodils, tulips, anemones) are cultivated for London and other

¹ E. M. Ward: *English Coastal Evolution*.

markets, and on which seaweed is largely used. These little fields are almost entirely below the 200-foot contour line, and approximately where the plateau surface merges into the cliff.

Here and there some new houses have been built among them, for those who seem to prefer an extensive view to the shelter demanded by earlier inhabitants, whose work, too, would lie nearer the shore. Therefore a general view of the village from the north shows its activities and interests in a succession of 'strata'. Below is the shore with its rocks and caves and patches of beach where seaweed is cast up and where 'semi-precious' stones may be found. Then comes the old village, clinging to the harbour, and the coast road, made as noted above, at the level of an ancient (now 'raised') beach. Then there are the little bulb-fields and gardens, on the sheltered upper slopes, with new houses for residents and visitors, and finally the open, treeless plateau surface, supporting a few farms surrounded by small fields devoted to pasture for cattle, interspersed with patches of gorse and bracken.

Very different is the plan of a village which is situated in the district of Map II, where buildings are widely scattered over the countryside, though not altogether at haphazard. Although the nucleus of the village lies about three-quarters of a mile below the source of the stream flowing south-west, and on its southern bank, another group of cottages lie placed about 200 feet higher up the valley-side, the church and rectory for historical reasons, are about half a mile distant, across a 'common', and there are many isolated farms, some of them of considerable age. But nearly all the buildings are found to be near to, or between, the contours of 500 feet and 600 feet—the level in this district of what is known to geologists as the *spring line*. Water, which has been absorbed by the porous limestone of these uplands, and is held up in the more sandy beds below, which cover, in their turn, 'upper lias' clay, flows out in a series of springs on the hillsides. This, therefore, is the 'ground-water' level, on which some of the houses have wells of their own, and others use a spring near by. Very few buildings occur on the higher slopes, where wells in the thick limestone would be deep and costly. In country of this type villages and farms tend to be hidden away in valleys, and are often far from the high roads which follow the more level and often drier uplands. However, apart from the actual village, a series of mills follows the main stream (some are now in ruins, others converted into cottages). These were built at points near to where the stream crosses a

fault-line, or flows from one geological formation to another, and where, therefore, a change in the gradient might occur.

The village on Map I is closer to the river, where hard rock abuts on to the stream, and where the bridge, leading from the main road, crosses two shallow arms of it, for much shingle and silt has been deposited there. In such country, with its hard rock and surface streams and mountain torrents, the problem of water-supply is simpler than in limestone country, but there is little *soil* to cultivate, except where valleys widen and enough has been deposited either in a former lake-bed or by river floods, or possibly by glacial action. In such regions old trackways, of which more and more are being converted into motor-roads, follow the bottoms of the U-shaped glacial valleys. In the wild mountain country to which these tracks lead tiny villages or groups of farm buildings or cottages (centres for sheep-farming or quarrying) naturally grew up at the meetings of such valley-routes, or at places where valleys widen and there is sufficient soil for a few fields, or sometimes near the head of a lake where a delta has been formed.

A very different state of affairs is indicated on Map III. A large town has grown, and is still growing, southwards on both sides of the river, but for the most part keeps well away from its interlacing branches and its frequently flooded meadows. To avoid confusion the extent of the town has not been shown on the map as reproduced, but the plan of an old village is shown farther south, on the east of the river. Few buildings are actually *on* the river-bank, and these, incidentally, are boat-houses, and opposite, a small hotel which caters for boating-parties. At the date when the map was compiled the village—the wonderful Norman church, school, houses (some of which are very old)—kept well away from the river, and close to the contour line of 200 feet; in fact, the village itself curved round *with* this line, on the side of a little hill which rises to 294 feet. From the contour line there is a steep drop of about 20 feet down to the flat flood-plain of the river. The local geological map shews that this hill is of the limestone known as 'Corallian' but that the summit is covered with clay of a later formation and therefore higher than the clay of the river-bed. Dry, porous rock thus forms an outcrop between the two layers of clay and it is on such fertile and water-bearing rock (where wells could be made) that the older houses are found. The shape as well as the site of such a village is likely to have been, to a great extent, influenced by geology, and even the

recent buildings, including a large cluster of 'pre-fabs' follow the course of the porous rock, hardly encroaching at all on the clay which covers this little plateau. On Map III it may be noted, too, that the old road runs round, and not over, the hill.

Examples will doubtless occur to the reader of villages which, even long ago, spread along an important highway, the older houses being distinguishable from those due to modern 'ribbon development'. In such cases it is worth while to consider the uses made of such a road and the period of its greatest importance. Other villages have grown round a 'green' which perhaps still remains, or has only recently been obliterated by modern buildings, but of which the outline may still be traceable by means of the old houses and gardens surrounding it.¹ Then there is the 'scattered' type of village or town which has developed from little hamlets or groups of houses which grew up in the clearings of a forest and were only connected by paths or trackways. Such sites give interesting evidence of the former character of the district and lead back again to the problems of its soil. One such village among the beechwoods of the Chiltern Hills was studied by children whose work is described in the Board of Education's Pamphlet. No. 61, on *Village Survey Making*. The distinction between 'compact' and 'scattered'² types of village has been much studied recently in Europe, and is thought to throw much light on the early history of settlements;³ and needless to say, in making maps or plans of the lay-out of a village great care should be taken to distinguish old houses, or sites, from recent additions, as well as to try to discover the significance of recent growth in any particular direction. The examples quoted may show that it is worth while for scholars to consider the geological as well as the topographical site of a settlement side by side with the study of evidences of its former inhabitants.

Exercise 25. One or more of the scholars should trace, from the local 6-in. map, all buildings there shown, adding no other feature except the main streams. Place this tracing over a map of contour lines, and over that showing geological observations, or showing wells and springs. Discuss how far these may suggest a reason for the home town or village site. Out of school, note which buildings are dwellings, which are public buildings, which are farm buildings, and distinguish these

¹ C. A. Simpson: *Rediscovering England*. William Page: 'Types of English Villages' (*Antiquity* 1927).

² William Page: 'Types of English Villages' (*Antiquity* 1927).

³ Harold Peake: *The English Village*.

on map. Try to discover dates of as many as possible. Collect photographs or drawings of the most interesting and characteristic architectural features of the district. Make notes as to building materials and whether these are of local origin. Compare with pictures of the architecture of another region *where the geology is different*.

Exercise 26. How far do shapes of villages differ in different geological regions? Make tracings of several towns or villages from the local 1-in. map, noting various typical plans.

CHAPTER X

SOME RECORDS OF LOCAL HISTORY

THE acquaintance already made with the local sheet of the Ordnance Survey map may have shown the importance of the geological and topographical setting in considering present-day conditions in town or country. Problems of local history too can often be explained, to a greater or less extent, in this way. Evidences of human life in long-past ages are found in most districts, and are distinguished, on large-scale maps, by special symbols or lettering, which often arouse the interest and curiosity of young people. Interest in local history is very general to-day, but is often limited to the reading of books or telling of stories, or perhaps making a catalogue of objects of interest in the neighbourhood. Interesting as it may be, to be shown, and explore such antiquities, the work gains much in value and interest if they are considered in connexion with *the character of the surrounding country* as it is and as it was. Some elementary knowledge of the chief periods of early and pre-history¹ is often taught in schools, and may be illustrated by any local 'finds' to be seen in a museum or in the field. But before these are visited it would be worth while to trace any *sites* of archaeological interest from the local map, and, as before, place this tracing over those showing surface water, contours, and soils. In Map II Neolithic (Long) Barrows stand on almost the highest points of the escarpment, close to its edge, and another is shewn on the north east of the map. The road following the scarp edge, after passing near a Bronze Age 'tumulus', leads to a spur crowned with a camp of the Early Iron Age, shewn by contour lines to be in a naturally strong position, making good use of geographical aid. On Map IV, the camp is shewn to be placed in a position commanding the low-lying coast, and also the gap through the downs now used by an important road. Such ancient camps (and other earthworks considered by some to have been merely enclosures for cattle) are often placed above, or near to, a natural spring, as in the district of Map II. In the district of Map IV, where surface water is absent, several ancient but artificial dew-ponds are found in the vicinity, such as have been made in many districts of porous rock where

¹ Jacquetta Hawkes : *Prehistoric Britain*. R. G. Collingwood : *Roman Britain*.

natural streams or springs are scarce.¹ So many old earthworks, stone circles, or single stones, tumuli, and 'finds' of flint tools or weapons occur on high, open country that many people are puzzled when these are occasionally found on lower ground, and here a map of *soils* would help to solve the problem, as it was usually dry, rather than high, ground which was sought by these early people. A comparison of the sites chosen by them with those chosen by later people, after forests were cleared and land was drained, is full of interest. Therefore such sites should be visited, if possible, *with* a map which shows the surrounding country, and after their exact positions with regard to other features have been noted. Fascinating as such study may be, however, scholars should realize that, where no authoritative information is available, it needs expert knowledge and much study before definite statements can be made, and that even experts tend to differ! But accurate mapping, especially if accompanied by photographs and descriptions, is always worth while, and may be of real value.

Other relics of the past which are shown on local 6-in. maps and are of importance also, at the present day, are parish boundaries. There is not space here to discuss the origins of parishes,² but their boundaries are often of great antiquity and are sometimes those of an ancient manor. It is often found, therefore, that the parish includes land which is very varied in character, as the self-supporting community of former days would need rough pasture, or woodland, good arable land, and meadows for hay within its boundaries, besides water-supply, and if possible a good site for a mill. (Several old *water mills* are found on the swift stream shown in Map II, while Map IV, which has no surface water, shows the sites of two old *wind-mills* on projecting spurs of the hill country.) Any parish boundaries shown on the local 6-in. map should be traced, and the character of the land, with its natural vegetation enclosed within them, should be investigated; also the position of the church, and, if known, of the old manor-house. Parish boundaries very often follow natural features—a river, or a water-parting, or a strip of marsh. Sometimes they follow a road, and where this occurs the road is likely to be older than the parish. Roman roads³ divide many parishes, and fragments of old roads, now obliterated, have been discovered as being in line with certain straight sections of parish boundaries.

¹ C. H. B. Quennell: *Every Day Life in the New Stone, Bronze and Early Iron Ages.*

² H. J. E. Peake: *The English Village.* C. A. Simpson: *Rediscovering England.* N. J. Hone: *The Manor and Manorial Records.*

³ Ordnance Survey Map of Roman Britain.

Maps which show the boundaries of each parish are useful in the comparison of the extent and shape of the home parish with others. Usually regions which were densely populated and fertile and where the land varied much within a small area, supported more, and smaller, parishes than did tracks of poor hill or moorland country. It may be noted to what extent the *shapes* have included several geological formations (glacial drift is often of importance when on clay land), and how often the early settlement was either near a stream or on a spring-line; sometimes near, if not on, an old road.¹ In the study of parishes scholars should discuss how far the present boundaries are useful (or inconvenient) at the present day, whether new churches have been built, and from whence the congregation is drawn. In a village this will lead on to the work of the parish council and other problems of local government, such as are often studied under the heading of 'citizenship', but surely these, like other questions of the day, gain in significance when considered in their geographical setting.

Exercise 27. Trace from the local 6-in. map, the *sites* of any objects marked in 'Old English' lettering or block capitals, or the sites of any known finds. Note carefully the kind of sites they occupy, by examining them with the surrounding features, as shown on the maps already made, and find geographical reasons for these sites.

Exercise 28. From the 1-in. map trace some towns or villages, to show, if possible, different types—such as compact, scattered, roadside, spring-line villages.

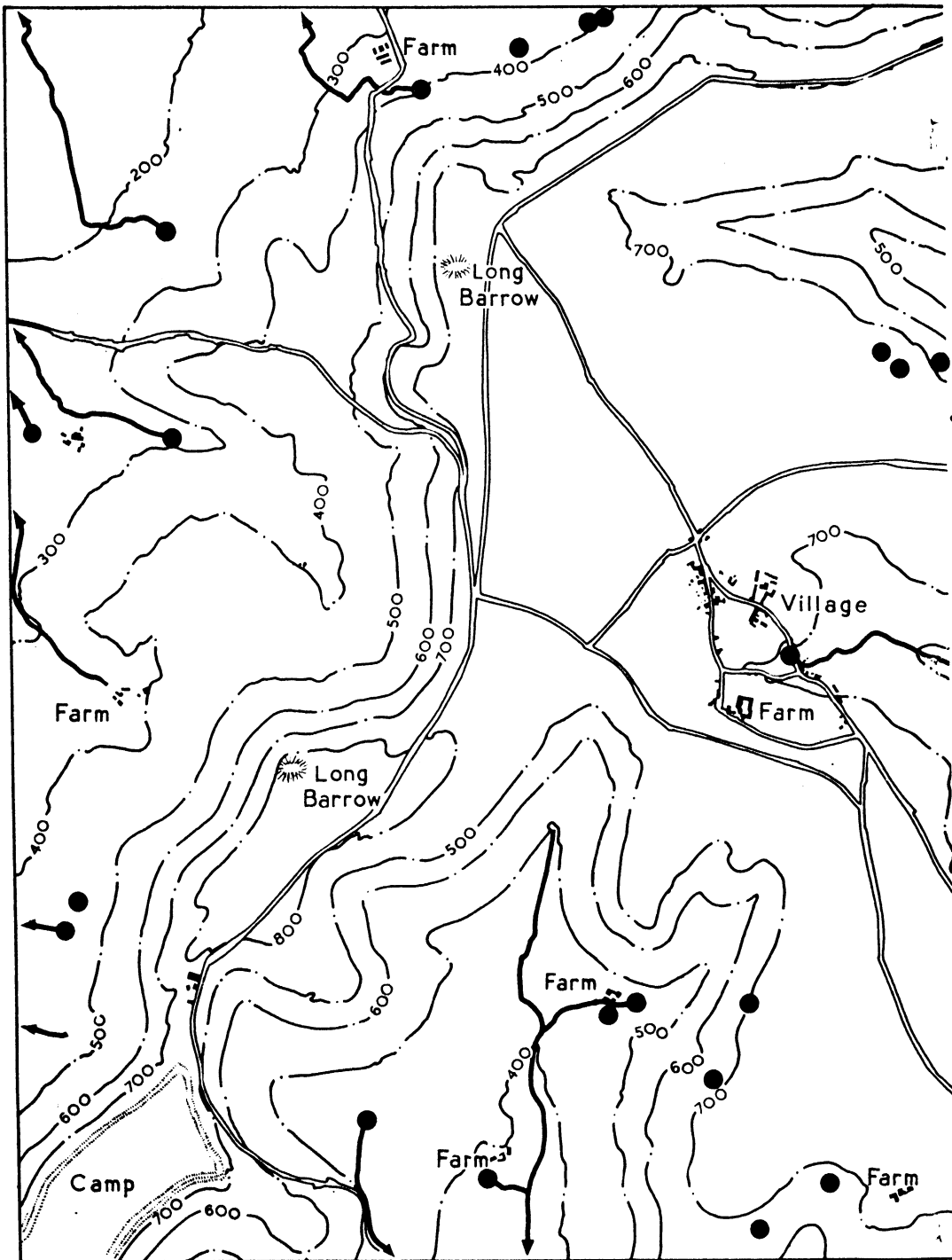
Try to go and see some of these types, noting where the shape is altered by recent building.

Exercise 29. Find your parish boundaries on a suitable local map. Consider its shape and size (1) with reference to topography, (2) in comparison with other parishes. Are different types of country, and different geological formations, included within it?

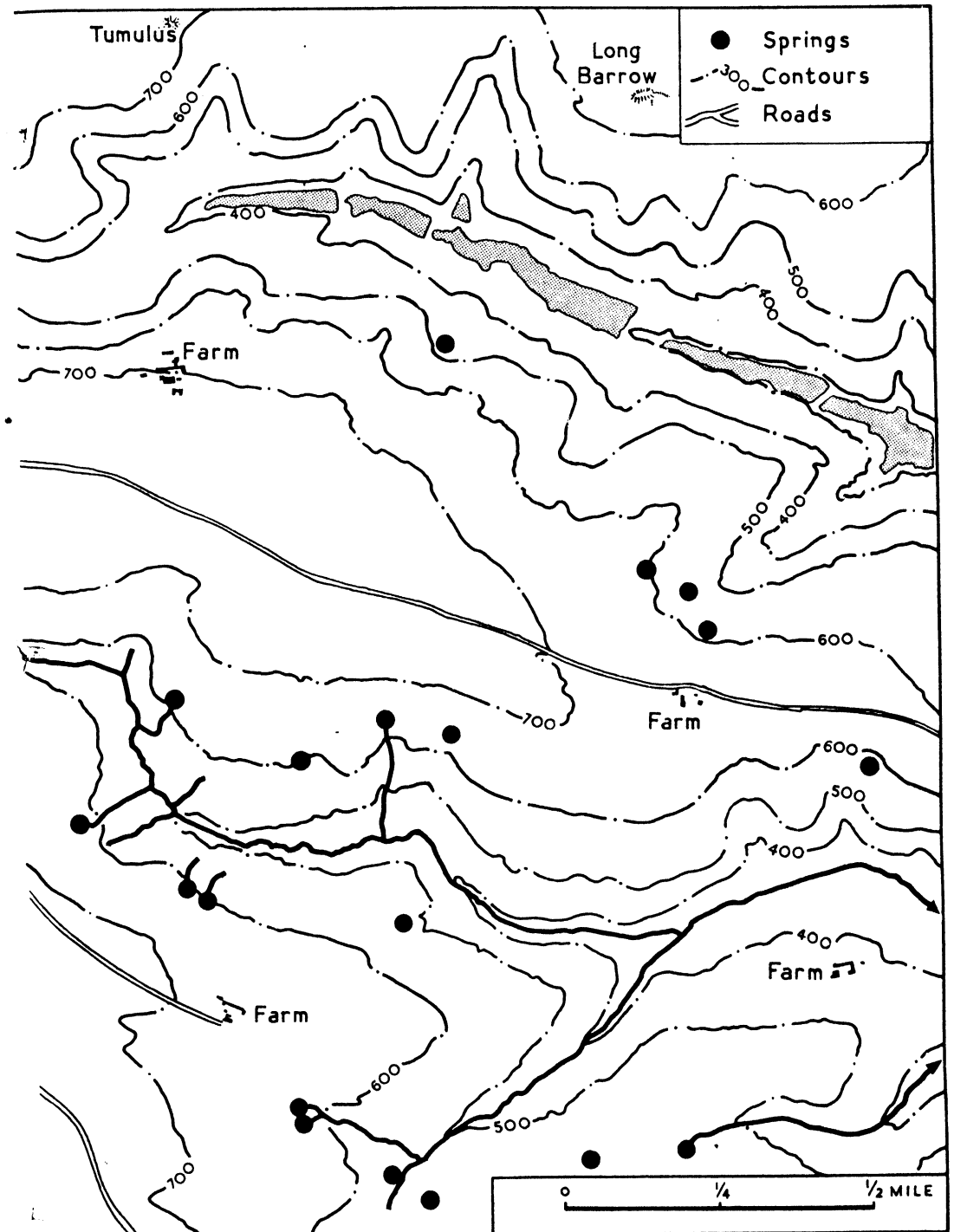
Exercise 30. Trace, from the local 6-in. map, any parish boundaries shown on

¹ William Page: 'Types of English Villages' (*Antiquity* 1927).

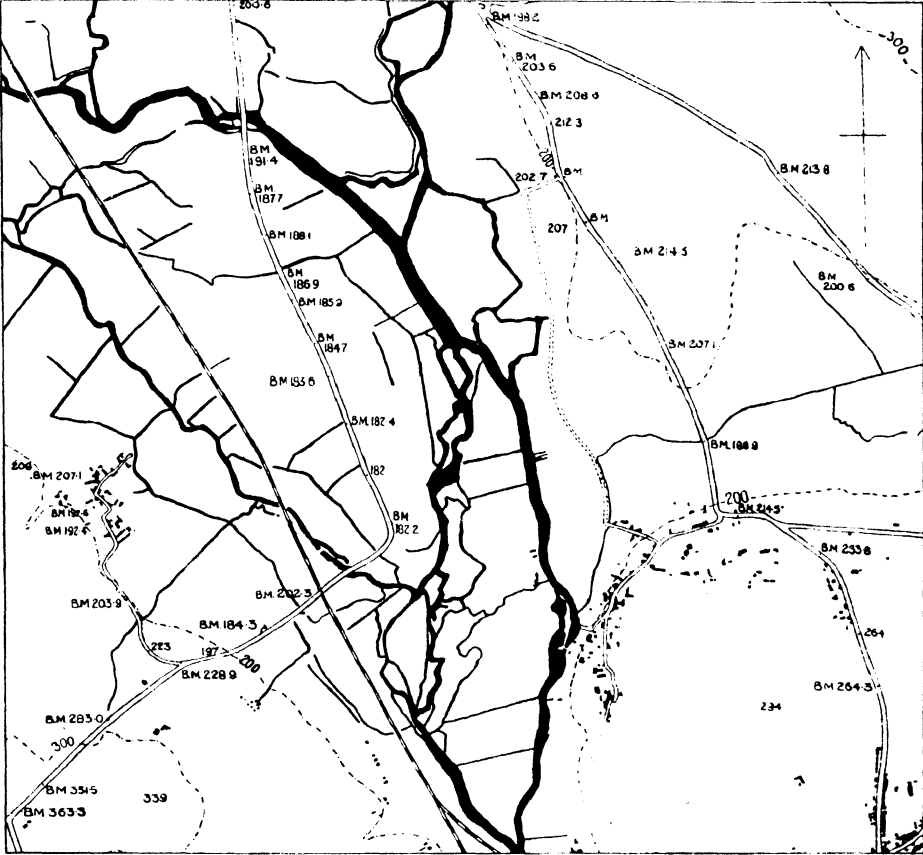
it, noting the topographical features they follow. (Walk along as much of the boundary as possible.) Place your tracing over maps already made, and consider possible causes for course of boundary. Is the church centrally situated, and how is it approached from outlying parts of parish? Find out all you can of the history of the church, with date of its foundation.



DISSECTED PLATEAU COUNTRY (WITH WESTWARD-FACING ESCARPMENT)

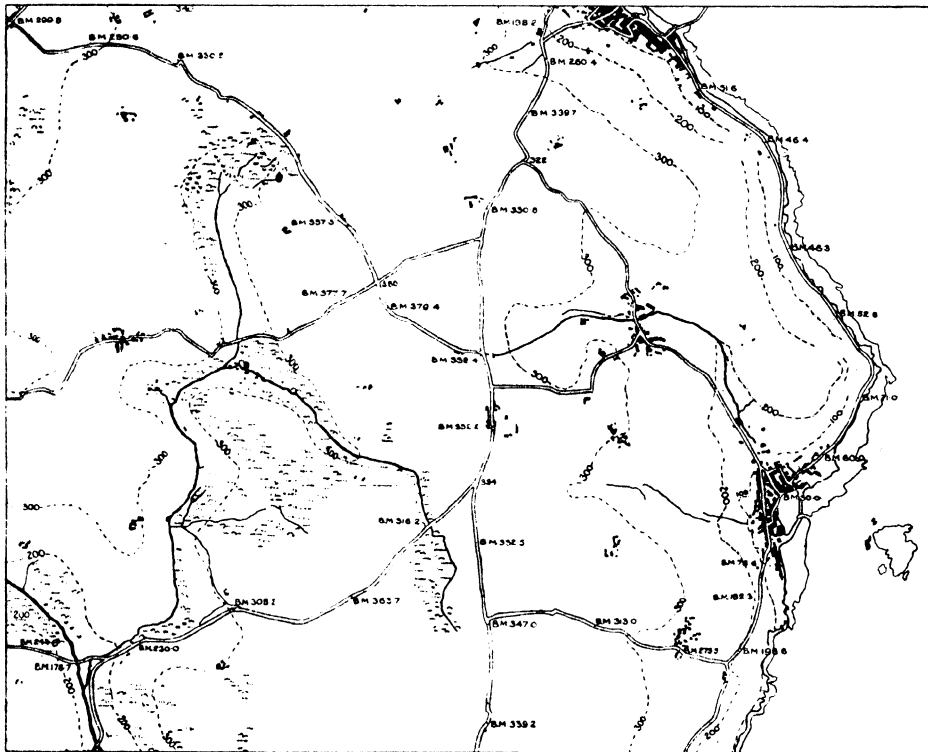


0 1/4 1/2 MILE

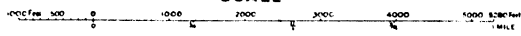


A FLOOD PLAIN

MAP V



SCALE



A ROCKY COAST

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