GEOGRAPHY IN SCHOOL

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BY

JAMES FAIRGRIEVE, M.A.
FORMERLY READER IN EDUCATION IN THE UNIVERSITY OF LONDON
INSTITUTE OF EDUCATION
AUTHOR OF "GEOGRAPHY AND WORLD POWER," ETC

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PREFACE AND DEDICATION

THIS volume is the outcome of some thirty years' experience of geography in many types of elementary and secondary schools in Great Britain. However badly carried out, the aim is to be both philosophical and practical. An attempt is made to formulate a philosophic basis for the teaching of the subject, and to indicate methods of dealing with it which will at least be in agreement with such a philosophy.

On laying down my pen after completing a manuscript, the first rough draft of which began to lie on my desk over twenty years ago, the dominant feeling is that what has been said all seems very obvious, and that it is not worth while to publish what has been written. Little of the matter is now really new; most of it has been said by other people; the various chapters are largely founded on lectures or notes of lectures in which the ideas were first tried out, and it is to be feared that many traces remain of the form in which the original material was cast.

It is only the kindly expressed desire of teachers and old students to have in black and white something of what they have heard which emboldens me to set out those ideas in print. I hope that they may not be disappointed.

The book is in some sense a confession of faith.

The first rough draft to which reference has been made was written before any other geographical publications in which I have had a hand had even been considered. These came into being as the result of the philosophy and the practice which were always consciously before me, though the philosophy took clearer shape as time went on and the practice was more surely directed towards definite ends. What is here written may help to make plain what I have been trying to do in these publications and in other ways during the years in which I have been working for the improvement of the teaching of geography in school.

But while the book is a considered whole in idea, if not in execution, it is not written in any dictatorial spirit, but in the desire to let others know some of the things which experience has suggested to me. If statements in the text do not commend themselves to the reader, he or she is begged to pass on to those that appear useful.

Three points should be specially noted. In view of the title it is perhaps superfluous to indicate that the book deals only with work in schools: what is done in universities is outside its scope. All that need be said of the latter institutions is to point out that the work there done should probably differ both in content and in method from that which is done in schools. Here it is more important to note the inverse truth that work which is done in schools should differ in content and in method from that which is done at universities.

It may be thought by some that too much pure geography is introduced into the discussions. But, first, this is one of the ways in which the manner in which the book took shape has left traces in the form now presented. For many years I had to lecture on the teaching of geography to students, whose knowledge of geography was not of the widest, and to whom I had, as delicately as possible, to suggest how their knowledge might be increased. Secondly, and much more important, there is the fact that it is impossible to write about teaching unless we know what we are to teach ; matter and method cannot be separated.

Also it may be noted that there is no chapter specially devoted to "practical geography." This is deliberate. There is no such thing as practical geography apart from geography, any more than there is practical arithmetic apart from arithmetic ; but an attempt is made to show that geography is at least as practical as arithmetic and is not merely a thing to be got up from books.

Finally, I wish to acknowledge how much I owe to the multitude of teachers and pupils whom I have seen at work on the study of geography, but specially I wish to acknowledge my indebtedness to my old pupils in Kelso High School, in Campbeltown Grammar School, in New Southgate High School, and in the William Ellis School, as well as to my students in the London Day Training College. Without them the book would never have been written, and

TO THEM IT IS DEDICATED.

November 1925.

Note.—Opportunity has been taken of the issue of a new edition to bring up to date references to developments in the use of pictorial illustration, especially the epidiascope and film projector, in which I have long been interested, and to include my presidential address to the Geographical Association which rounds off forty years of teaching.

February 1937.

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CHAPTER I

THE PLACE OF GEOGRAPHY IN EDUCATION

Geography is at once one of the most important of school subjects and one of the most difficult to teach. Some people do not think it is important and many people have not thought that it is difficult, but little success can be attained in teaching geography unless one is convinced both of the importance of the subject and of the difficulty of teaching it. If a teacher is sure of the first, he has confidence in his mission, without which success is impossible. If he is sure of the second, he will avoid many mistakes and make success much more sure.

As it is imperative for the teacher to understand the importance of his subject, we shall consider *why* geography is to be taught in schools before we consider *what* geography is to be taught in schools and *how* geography is to be taught in schools. It is true that to some extent the answer to the first question depends on the limitations which may be found when the second and third are answered, but unless a teacher knows why he teaches his subject he has no criterion by which to select his material, nor has he any guide as to how he should treat the material he has selected. A discussion of aims is fundamental.

Of course there is more than one answer to the question, "What is your aim in teaching geography?" If many teachers (especially young teachers) were asked at the beginning of a lesson what they wished to do, and if they were quite honest, they would say they chiefly wished to get to the end of it as soon as possible, and with as little discredit as possible. This of course does not carry us very far.

Teachers of more experience often aim at being submissive to authority. That is to say, teachers do what they are told by inspectors and headmasters, or what the books advise, or what is "set" in the examination syllabus. In a primary school it is probably the inspector or headmaster who is the authority to be propitiated. In a secondary school the headmaster is not so likely to lay down the law; it is the examination syllabus which determines the work, and the aim of the teacher is to cover the syllabus and to get his pupils "through" the examination.

A good deal may be said for, as well as against, authority. Much has been done by authority in screwing things up to a higher standard than they have reached in the past. But though the effect may be quite good, obviously we have not here the answer to the questions, "What is behind the headmaster or inspector or examiner?", "Who examines the examiner?", "Why does he ask these questions?", "Why *should* we teach geography?". There are good reasons for including geography in the curriculum. We shall put one of them in the form of a story.

A French priest was once found wandering in distant California, and was asked what he was doing so far from home. He said: "I had a dream in my little parish in France, and dreamt that I had come to the end of my life, and was summoned into the presence of God, and the first question He asked me was, 'What do you think of my earth?' I was very much embarrassed, and had to tell the Lord I had not been outside my parish." *He*, at any rate, had some reason for learning geography, and the reason was not any imposed by authority. He thought he ought, and would like, to know something about this world on which he lived.

One function of the geography teacher, then, is to help the Almighty a little in this matter; but we must have more definite, though not better, reasons than this. In order to understand the place of geography in education one must, indeed, have a theory of living. This is very largely a personal matter, so that, in order to understand why the author believes in geography as a subject in education, it is necessary to say a word or two on education in general. Education may be said to have two purposes. One is to help people *to earn a living*; the other to help people *to live*. If education does not do one or other or both of these things in the biggest sense, it is not of much use. Education for either of these two ends has changed very much in the course of time. It is a comparatively modern idea that great numbers of children should be taught together how to live or how to earn their living.

The things that were taught to our neolithic ancestors in Britain were different from the things taught now, and they were taught somewhat differently. The things which had to be learned, those absolutely necessary for existence—how to obtain food and clothing, and how to defend themselves—the young people picked up, and were very anxious to pick up. There was no very great objection to learning. People learned things because they wanted to learn them, and they were useful to them.

Four hundred years ago conditions were not so extraordinarily different from what they had been four thousand years before. There was, no doubt, a rather greater differentiation of society than in neolithic times, but the stimulus to learning and the method of learning were much the same. Even the things learned were not greatly different. Young people learned how they might subsist by imitating those who were doing so. There was the craftsman who learned his job, learned how to earn his living, by apprenticeship. Then he became a journeyman, and perhaps a master. The farmer's son learned how to farm in the field; the women of the community learned their job of home-making, the most important job in the world, in the same way, by doing the work.

People learned to spend such leisure as they had in the same way. Whether four thousand years ago or four hundred years ago, men had leisure time when they were not actually engaged in providing the necessities of life. This leisure also they learned how to spend, by imitating others.

A few people wished to do something more. These were very few in each community, though numbers increased as time went on. They wished to think a little more about ways of living and of how to spend leisure, and in various ways separated themselves off from the rest. They very often found that it paid them to spend their time thus; it gave them wealth or power if they desired, but these were not usually sought.

In this connection it is interesting to remember that the word "school" means "leisure." It was a place where men went to learn the best ways of spending their leisure. Into schools, colleges and universities collected the people who really thought, not just for themselves, but for other people. The school was the place where they went to think about living, to think how they ought to spend their time here and hereafter.

Nowadays conditions are different. Schools are now, in great part, places where people learn directly or indirectly how to earn their living, where we teach arithmetic for the city clerk and the classics for the clerk in holy orders.

The schools where earning one's living is taught are of various kinds—trade schools, technical schools, training colleges, business colleges and universities. Sometimes one is tempted to think of the latter as almost entirely factories for turning out people with degrees. They are mainly technical schools for the professions—for doctors, lawyers, engineers, teachers and clergy. Certainly one does not associate the idea of leisure with a university degree. In these institutions men and women learn how most easily, and with least expenditure of energy, they may earn their living. This is, of course, a very laudable aim. But earning a living takes up an extraordinarily small part of one's life. If we cut out the years before earning a living is possible, and those after earning a living is possible, and holidays weekly and yearly, it is found that even in the case of the housewife, and much more in other cases, earning one's living takes up a small portion of life. An average would probably be about one-fifth.

Even if allowance is made for the time we spend in sleeping, there is a great portion left. There is still this living to be done and far more of it, with far more leisure, than there ever was.

But not only is a *big* part of life taken up otherwise than in earning a living: an *important* part of life is concerned otherwise than in earning one's living. We have duties as citizens of our country and as citizens of the world. It is difficult to say shortly in what these duties consist, but, speaking roughly, the golden rule with which we all agree is to think of our neighbour as of ourselves. Now, here comes in a difficulty. In the old days the answer to the question: "Who is my neighbour?" was quite easy. One knew to whom that duty was owed. But who are our neighbours to-day? When we have wireless messages flashing across the Atlantic, when we have the happenings of one side of the world affecting the happenings on the other side, when events in Europe or Asia at once send down the exchange on the New York market, who is your neighbour? Everybody. Where does he live? The world over. Nor is it sufficient to act on the principle, "Do as you would be done by," for many men are so different from you that they do not wish to be done by as you wish to be done by.

Now, if education is going to do anything, it ought to give some kind of guidance as to how we must do our duty. It is not enough to desire to do what is right: it is necessary that there should be some basis for understanding the problems with which we are confronted. Without knowledge it is impossible to do our duty. It may be true that even with knowledge we may be able to do but little. Nevertheless, it is better to be able to do a little than to do nothing. We may make mistakes with our little knowledge; we cannot help but make mistakes if we have none.

In a scheme of education with such aims, where does geography stand? Other subjects help in the preparation for life and the larger life. Geography must answer their implied challenge.

In the first place, though it is not a point that need be pressed, geography pays. Earning one's living may be easier with a knowledge of geography than without it. It would seem self-evident that, with the widespread business interests of the inhabitants of Britain, some knowledge of other lands would be desirable. To put it at its lowest, it pays to have some knowledge of the conditions under which people live, who are purchasers or possible purchasers of British goods; the more geography is known the better trade is likely to be served. As a matter of fact this is the case. Successful business firms do study the tastes of other people and the conditions of foreign markets. Even so, however, it may be doubted whether the value of geography as such to the business man is at all understood. There is probably no commercial house in Britain, carrying on business all over the world, whose advisory accountant has recommended that a professional geographer be appointed, to whom heads of departments could refer for advice on matters of business, and it is still less probable that such a recommendation has been acted on. Yet such a recommendation has been made and acted on in New York, simply and solely because it paid.

Geography then pays; but it is not because it pays in a material sense that its claims to inclusion in the curriculum are advocated. The real value of geography lies in the fact that it helps man to live; it helps man to place himself (the word "place" is used advisedly) in the world, to learn his true position, and what are his duties.

Geography is a science in so far as it enables man to compare himself and his surroundings with other men and their surroundings. Some sciences deal with measurement of material things; others, such as psychology and biology, may deal with the measurement of man in certain specific ways, but geography and history stand by themselves in dealing with the measurement of man in his space and time relationships. They are at once sciences and humane studies. Geography enables man to place himself on the world and to know where he stands with regard to his fellows, so that he will neither exaggerate nor diminish his own importance; it enables us to understand other people, to some extent, by comparison with ourselves. By a study of geography we are enabled to understand facts without a knowledge of which it is impossible to do our duty as citizens of this very confusing and contradictory world.

We study other regions with their common measures of thought and habit, whether organised in parish or province, in commonwealth or kingdom; we realise the past experience of other people to be different from our own, in order that we may make allowance for their points of view; and we study our own region, for only by a study of that have we the necessary grip of realities by which we may understand the various circumstances of other folk.

This view of the position of geography has been put forward by Professor Atwood of Clark University, Massachusetts, when he said: [1] "There never was a time in the history of this country, or in the history of the world, when a study of the various people of the world, and the geographic conditions influencing their lives, directing their plans as they seek for means of existence, should be taught so thoroughly as to-day. The responsibility is before us. I submit that there is no subject in the elementary school curriculum that so naturally and so necessarily deals with the large world-wide problems of to-day, as geography. There is no subject in the school curriculum that can so appropriately deal with the actual living conditions in the different parts of the world, at the present time, as geography."

A slightly different aspect of the same idea is presented by Professor Fleure, when he says: "Geography offers a most hopeful line of work for a better understanding between the peoples of the world. A generation of education on geographical lines is needed with the idea running through it, that the people of each region have special problems and must solve them in various ways."

There, then, is the position. There is a claim from geography for a place in the curriculum, not because it pays, but because we cannot have an education worth the name without geography. The problems

[1] Presidential Address at the meeting of the National Council of Geography Teachers, 1921.

with which the world is confronted are bad enough if we can see what they mean, and are simply insoluble if we do not. Whether one is an imperialist or an internationalist, whether one is a believer in the League of Nations or in the doctrine of each country for itself, a knowledge of geography is essential.

We cannot do much, any one of us, but we can at least do more if we know a little better which is the right direction in which to move. It is because geography helps us to move in the right direction, because it helps us to know our limitations and to know the limitations of other people, that it holds a place in the curriculum.

Indeed, one may go so far as to say that setting aside original sin, or whatever is its modern equivalent, and present-day weakness in the teaching of history, there is not one single thing which stands so much in the way of social and international advance as a lack of knowledge of geography. Better than most subjects, because it has a warmth of sympathy tempered by dispassionate accuracy, is it fitted for the promotion of goodwill throughout the world.

Here we have at least one answer to the question why we teach geography. It will be this answer which is assumed in what follows.

CHAPTER II

WHAT IS GEOGRAPHY?

We have suggested the fundamental reason why geography should be taught in school, but we have taken one most important consideration for granted. We have assumed that we know what geography is. In this chapter we shall attempt to discuss this matter in the light of what has already been said. First it will be convenient to take some of the definitions of geography which have been given and discuss them, not because it is necessary to have a definition, but because we may be able to obtain some knowledge of what has been thought to be the function of geography, and may be able to learn not only what is the content of the subject, but something of the method of teaching it.

1. *Geography is the description of the earth.*

At first sight this appears to be a perfectly adequate definition, especially as it has authority behind it. Surely when we study geography we are dealing with descriptions of the earth, and most of the evening lectures of the Royal Geographical Society, the premier geographical society in the world, are but descriptions of the earth.

Nevertheless, it may be doubted whether this "travel and topography" definition is entirely adequate. Travellers return and give accounts of their wanderings in the parts of the world most difficult to reach—Timbuctu and the Amazon, the South Pole and Mount Everest. They produce maps showing how their routes lay, how a river was crossed here, a forest traversed there, and how a mountain was climbed to a certain height somewhere else. The traveller tells of his experiences and of what he saw at successive points in his journey. It is interesting, but there is a lack of something essential, and this apart from the paucity of lectures dealing with lands where live the people who really matter.

A typical number of the *Geographical Journal* suggests the same shyness in dealing with important regions and a gusto for disconnected detail.[1]

The geography which is a description of the earth would seem to be a rather scrappy if august affair. It may be granted that descriptions of parts of the earth may form the raw material of geography without granting that it makes up the whole of the subject. Such geography is certainly not the kind of geography which will help the ordinary citizen, and has little claim to a place in the curriculum.

2. *Geography is the science of distributions.*

It is a distinct advance to have the word " science " in the definition. The first definition was not science; there is no orderly arrangement. When the isolated

[1] The contents of the first number that the author picks up, November 1923, are as follows: " From Oquair to the Ruins of Salwa," "The Tedi River District of Papua," "Re-marking the Air Route from Ramadi to Landing Ground R," "Note on Professor J. D. Everett's Application of Murdoch's Third Projection," "The Ross Dependency," "Kalat-i-Nadiri," "Notes on the Okovango and Kunene Rivers," "The Marine Chronometer," Reviews, The Monthly Record.

facts are classified we begin to have a science. We do not merely say, "Here I saw a river, a mountain, a negro, or a particular kind of tree." We say, "Here and here and here are negroes," "There and there and there are forests," "Over such and such an area the ground is high." This is introducing some order into the subject; we cannot understand much geography until we begin to see some order in the arrangement of things. It is when we begin to classify likes that we begin to learn geography.

This definition is then quite true; it is an advance on the other, but is it the whole truth? There does not even yet appear to be a likelihood of obtaining help in learning to do our duty to man. Further, it rather suggests that geography is composed of portions of other sciences. It would seem as if an entirely satisfactory definition would take some account of these objections.

3. "*Geography is the science which treats of the relation between the earth and man*," or "*Geography is the science which treats of the influence on man of local conditions and space relations*."

Here is a great difference between this definition and either of the first two; we begin to see some reason for studying geography. There is not only a classification, there is a principle of classification and there is a unifying idea. We have "man" definitely mentioned; this marks an advance. At the same time even this definition, though it speaks the truth, does not speak the whole truth. It cuts off man too abruptly from everything else; man, on the one hand, is opposed to everything else on the other.

It is doubtful whether the next definition is any better than this one, but it emphasises a rather different point of view which is quite correct. It says that:

4. "*Geography is the science of the relationship between physical inorganic factors and principles and the activities of organic factors.*"

There are two words here that stand out. "Inorganic" and "organic." The definition is sometimes put in a shorter form which places these two words in more obvious relation. "Geography treats of the organic response to inorganic control." Geography is the science which deals with the effect of these inorganic inanimate things, on the things that live—trees, plants, animals and men. This emphasises another element of the truth. It is true not only that the local conditions and space relations affect man, but that they affect all life, the life of man among them. There is, however, again a certain opposition. In the previous definition it took the form of: Man *v.* The Rest. In this we have taken some of "The Rest" over to the side of "Man," and we have Organic *v.* Inorganic. This again is not the whole truth.

5. "*Geography is the science which deals with forms of relief on the earth's crust, and the influence which these forms exercise on the distribution of other phenomena.*"

There has been a good deal of controversy as to what geography really deals with; but there has never been any doubt that whatever else geography does, it certainly deals with relief forms and the shape of the surface of the earth.

Relief is fundamental, perhaps the most fundamental thing in geography. This definition emphasises that importance at the expense of a good deal else. It is again true as far as it goes, but it is not the whole truth.

There are other matters which are part of the subject-matter of geography.

In this definition "relief" is the one "inorganic" factor left, and everything else is, as it were, taken over to the other side. We have, in fact, diagrammatically, The Rest *v.* Relief. There remains only one other step.

6. This last step is taken in Professor Unstead's [1] definition: "*Geography is the science which investigates the conditions of the macro-organism and the space relations of its component parts.*"

This means that, to continue the metaphor, everything is taken over to one side, and that Professor Unstead considers the whole world as a single organism, one great round organism, a unity. That is a true and very stimulating suggestion. The definition unifies the previous three, which give rather one-sided views of the subject. The same idea of unity underlies Sir Halford Mackinder's definition, "Geography deals with the actions and reactions that take place within the hydrosphere," though it may be doubted whether geography is either so exclusively concerned with action, or so all-embracing as is here suggested.

It is evident that all the four definitions last mentioned are true, and that any adequate conception of geography must combine them all. Each gives a facet of the truth.

Let us now examine the matter from another point of view and see what in fact has been taught as geography in the past. There have been, and indeed

[1] For much of the foregoing the author is indebted to Professor Unstead's important paper, "The Meaning of Geography," *Geographical Teacher*, Spring 1907.

still are, three main schools of geography teaching in Britain.

There was the "Capes and Bays" School. Children learned by rote lists of capes and bays, towns, mountains, boundaries, railways, islands and so forth, and at best, or worst, identified them on a political map. This was really a degenerate piece of worship of dead idols which superseded a real genuine live geography. It was very natural that our great sea explorers of Elizabeth's time should stress the importance of capes and bays, but, with a loss of understanding of what geography was for, we find these capes and bays taught by rote to millions of little children who never saw the sea.

Later, with the growth of the importance of science teaching, it was realised that this kind of school geography was useless, and an attempt was made to put the thing on a scientific basis. It was correlated with geology, physics, meteorology and mathematics, and then with the natural sciences generally. Perhaps the correlation was not quite complete, for geography tended to swallow, whole and undigested, large chunks of these natural sciences; yet for the most part geography became more orderly and sensible; it appealed to the reason rather than to the memory. But geography would not fit on this procrustean bed, and from the teaching point of view there were two disadvantages. On the one hand, in practice, it was a little unsatisfying; individual lessons, especially on so-called physical geography, might be extremely interesting, but the study as a whole tended to lead nowhere. On the other hand, the very insistence on explanations of geographic facts in terms of natural science only was profoundly unscientific. This was the case even when scientific geography was taught at its best. At its worst it became a rigmarole like that of the capes and bays geography, in which capes and bays, mountains and boundaries were replaced by isobars and isotherms, scarp-lands and fold mountains.

A further development naturally took place. In a desire to avoid the materialistic explanations of the scientific school, the world was studied as the home of man, as the place where man lives and moves and has his being. This is a real pendulum swing, and a return to the original attitude, for the capes and bays were at first learned not as abstract knowledge but because the knowledge helped man to move with more certainty over the surface of the sea. But anyone who has had much to do with the teaching of geography in the past few years realises that while the "capes and bays" geography was a waste of time, and while the "scientific" geography, though interesting and stimulating, tended to lead nowhere, the "story of man" geography very distinctly tends to be sloppy and to encourage loose thinking. There is a lack of "bite" about a good deal of it. The children so often seem to *know* very little.

The "scientific" and the "story of man" geographies each emphasise one part of the subject. There is no necessity to split the subject up into scientific and humane divisions. Geography is indeed all scientific and all humane, and we require a much more intimate association of the two than we have for the most part had in the past. We require the permeating accuracy and grip of scientific methods as well as knowledge of basal scientific facts, which themselves must be digested with geographic pancreatic juice. And we still require geography to remain sympathetically human.

Having now considered both the theoretical definitions and also the geography which has actually been taught, let us return to the questions with which we began the first chapter, "Why is geography in the curriculum?", "What is our aim in teaching it?". These questions can best be answered in terms of the function of geography just as we can best understand a saw by the work it does and the way it does it. We present, then, something in the nature of a confession of faith regarding what geography may do in school.

"*The function of geography is to train future citizens to imagine accurately the conditions of the great world stage and so help them to think sanely about political and social problems in the world around.*"

There are in this confession of faith two phrases on which perhaps a little may be said as they may appear somewhat strange.

"The world stage." The phrase suggests "man"; it suggests man living and acting; it suggests that the important parts of the world are those where the most important actions take place, whether these be the top of Mount Everest or London. This might seem to trespass in the province of history, but history and geography have two quite distinct provinces though they may deal with precisely the same things; they deal with the same things for different purposes. History deals essentially with the drama, geography deals with the stage on which the drama, and specially the present act of the drama, is played. Further, it is the *world* stage which we consider. The action of the drama is now world wide, yet each portion of the stage is related to every other portion. It forms a unity.

It is a *changing* stage; some parts are changing quickly even as we look, others more slowly so that we can see no movement, though from time to time we are conscious that there has been change; others again change so slowly that it requires long ages to pass ere any change is detected. Some changes take place under the action of natural forces; for others the actors in the drama are responsible, since the actors in this human drama are scene-shifters also, and as they change the setting and leave things lying about, so the scene is left for those who enter next.

"To imagine accurately."

We distinguish between "fancy" and what is called "imagination." When we think of fairies as existing we have an example of fancy. We may take a flower and make a design, from fancy, in a form a flower would never take. Imagination may perhaps include fancy. It is the process of making images and pictures of things which may or may not exist. But geography is not concerned in any way with fancy; it is concerned only with accurate imagination, with things as they really exist. Fancy has its place; it has a place in teaching, but it has not a place in the teaching of geography; things that do not exist form no part of geography. We are concerned in geography only with the things as they are in the world, and most of these things must be imagined. There is little possibility of their being seen. No one ever saw the whole of England at once. No one man, even during a long and busy life, ever set eyes on the whole of the world, and in geography we are concerned with much more than we can see. We cannot understand a fraction of the world unless we make an effort to imagine things as they are.

We believe, then, that the teaching of geography, of the kind we suggest, has a value not merely in school but as to preparation for the realities of life. It is an enormous advantage for anyone engaged in the business of education to teach what he believes rather than what he is directed to teach. Authority is good, but belief is vastly better. If a teacher is to make a success of his teaching of geography he must have a belief that his work is worth doing.

CHAPTER III

REALITY IN GEOGRAPHY

We have seen at the end of the last chapter how necessary it is that the geography which is taught should be real geography. The teaching of real geography is not by any means as easy as it might appear. In fact some acquaintance with geography as taught might induce a pessimist to believe that it was impossible.

In this chapter we shall examine some of the mistakes which are in fact made in teaching geography in order to see whether a frank facing of facts may enable us to understand something of the whole problem, and, perhaps, to suggest in what directions improvement may be looked for.

We shall adduce as evidence quotations from scripts written in examinations of the standard of the first public examination; that is to say, they are statements made by girls and boys who have taken geography as a chosen subject after a secondary school course; the statements are made at what is for most of them the end of their school education. The ideas which they have at that stage are likely to remain through life. They are not those of children in the midst of a course on the subject.

But though the source of the quotations is authoritative the quotations are scarcely necessary as evidence. Anyone with any experience of teaching in any type of school, at any stage, will recognise them as statements that are made daily, and in some cases hourly, in the geography lesson.

Perhaps it may appear that there is here some confusion of thought. It has been stated that the chapter will deal with mistakes of teaching, and then the evidence given is that the pupils make erroneous statements. It may be the case that all those statements are due to original sin on the part of the pupil, or that he has obtained his ideas outside school, but even allowing for those contaminating influences the evidence is overwhelming that the great bulk of the mistakes are due to the teaching. In some schools few mistakes are made; the few that are made may be put down to original sin and extra-school influence; but in other schools the number of mistakes is enormous. Nor is it one particular type of school which is good or bad. Schools in which few mistakes occur are placed in all kinds of situations, in town and country, in the slums of a city, and in the outer suburbs. It is contrary to all other experience that original sin, or the absence of it, should be so patchy in its incidence.

The mistakes which are vital in this connection are not mere minor misstatements of fact. Of course misstatements of fact are of very great importance, and if many mistakes of this kind are made there is probably some fault of presentation on the part of the teacher; but it is the easiest thing in the world to say the "Rhine" when we mean the "Rhone," or "east" when we mean "west," and even if mistakes of fact are made this does not necessarily mean that the geography taught is not in the main real geography.

1. Let us, however, take to begin with a comparatively venial mistake. In the explanation of monsoons a common phrase is that "the warm air rises and the cold air rushes in to take its place." Now, in the first place, the physical fact is that warm air as such does not rise. One cannot name any temperature, the possession of which would cause the air to rise. Lightness of itself does not cause motion; if a cork is placed in an empty vessel it will remain at the bottom; if water be poured into the vessel so that the cork is in contact with it, the latter will rise; but the contact with the water is as necessary a condition as the lightness. More than that, however, may be said. If one can separate the phenomenon into a cause and an effect at all, it would rather appear that it was the water which pushed the cork up. The whole of the phenomenon is in fact a unity, but what happens may be stated in such a way as to amount to an untruth. The original statement is, indeed, almost as if one said that the nail went into the wood and the hammer followed it. A table showing the mean dates of the commencement of the monsoon would seem to suggest that the cold air from the sea did play the part of the hammer.

Mean Date of Commencement of Monsoon.[1]

Bombay, 5th June.
Bengal, 15th June.
N.-W. Provinces, 25th June.
Punjab, 1st July.

[1] *The Climate of the Continents*, Kendrew, p. 110.

Here it seems fairly obvious that the movement is from the coast inland, and this suggests that the real driving force is the cold air.

This is, as we have said, of comparatively little importance; it deals with the scientific explanation of a phenomenon rather than with the phenomenon itself. If the phenomenon itself is realised aright things are not very bad.

2. But it is doubtful whether the phenomenon is realised entirely aright. Look at the statement again: "the warm air rises and the cold air rushes in to take its place." The tell-tale word "rushes" seems to suggest that the realisation is not perfect. From the table given above it is obvious that the colder air moves on an average at the rate of something of the order of 3 miles an hour. This can scarcely be called a "rush." And it is not merely that the statement itself is wrong, it implies other conditions which are entirely erroneous. It may suggest correctly the violence of the breaking of the monsoon, though that is rather due to "turbulence" than a "rush," but this is of short duration, and the monsoon rains themselves fall for the most part in a steeping calm. In fact the chief mistake is not that the meteorology is wrong, but that there is an unreal geographical picture.

3. Now let us take another mistake which again on the face of it is meteorological.

"Eastern Canada is sheltered from the moist westerly winds by the Rocky Mountains."

"The east of England is sheltered from excessive rain by the Welsh mountains."

The idea here suggested is obvious enough. It is common experience that if one stands to leeward of a wall, a building, or some other obstacle, the force of the wind is not felt so strongly as if one were to windward. Also, the stronger wind overhead tends to drive the rain over anyone standing fairly close to the wall. This is the picture which is presented by the word "sheltered," but it is exceedingly untrue as a representation of facts. One knows perfectly well that an obstacle 6 feet high affords little "shelter" to anyone standing over a mile away; an overcoat would still be necessary. Yet we are asked to believe that the mountains of Wales shelter the east of England though the scale is about the same. The highland of Wales on the west has an effective height which certainly cannot be taken as more than 1000 feet, though, of course, points rise higher, and a width of some 30 miles, while the east of England may be taken as 200 miles distant. On the scale of 6 feet to a 1000 feet, the highland will be 300 yards across, 6 feet high, and its eastern edge some 2000 yards from the east of England. It will certainly afford little shelter to the latter. The picture of Canada is if anything even more untrue. The mistake is, indeed, not meteorological at all, but fundamentally geographical. The scale is not realised.

The plain fact is that such statements show that there is no conception of fundamental realities dealing with the simple relations of things on the earth's surface. That is to say, statements are being made not about things as they are, real geography, but as they most emphatically are not. Pupils may be able to repeat correct statements as to sizes and distances in England and North America, but that cannot be taken as any guarantee that the facts are realised, and it is a *realisation* of the facts which constitutes a knowledge of geography.

The point need not be laboured, but the continual recurrence of such statements as the following show how serious the misunderstanding may be. "The rush of water from the Black Sea makes Greece more indented than Italy." "Just as Britain is close to the Continent of Europe, so is New Zealand close to Australia."

4. Besides the mistake in the matter of scale, the statements quoted above using the word "shelter," suggest another way in which facts may be apparently known and yet not realised. One would imagine that every boy and girl would say at once that the world was round if asked its shape. Yet it is certain that anyone who uses the word "shelter," as it is used in the above statements, has no realisation of the fact as it affects England and America.

The truth is that if anyone on the east of England were to look to the horizon on the west, his line of sight would pass 5 miles above the highest point of the highland of Wales. If one considers the conditions in Canada the rotundity of the earth has an even greater effect. It might be advantageous to draw a section across Canada to true scale taking the rotundity into account. The ridiculousness of the idea of shelter might then be apparent.

It is the lack of realisation of the same fact which permits such statements as "Australia is an island continent; it is situated to the east of the British Isles." Perhaps even more conclusive as to the prevailing lack of realisation of the rotundity of the world is the fact that out of 1500 candidates in an examination of the standard of the first public examination, not a single one answered even approximately correctly a question concerning the direction in which one would start to go by the shortest way from San Francisco to Tokio, and *vice versa*. The fact of the rotundity of the earth was never taken into account because it was never realised.

5. Consider now another mistake; we cannot go far in teaching geography without being informed that "the west of Scotland is so indented because the rough Atlantic waves have worn away the land." Sometimes the story is slightly varied, and we are told that it is because the soft rocks are worn away and the hard left. Of course this is simply untrue. No waves of the Atlantic would ever wear away land at the head of a long sea-loch. That the truth is the direct opposite is seen by the fact that the head of each sea-loch is steadily filling up and the lochs are being shortened. One trouble here again is that the explanation is erroneous. It is, of course, a pity that time should be spent in learning wrong explanations. It would be better to spend the time in learning what actually has happened, but even so it is true that one may have a fairly good idea of the geography of the west of Scotland and yet hold erroneous views as to the causes which have been at work in bringing these lochs into existence.

Sometimes, however, an explanation of these lochs is given which has a specious appearance of being more correct. This is to the effect that "The valleys have been worn away by streams and glaciers, then the land sinks and the sea rushes in." It is our old friend "rushes" which makes us pause. Granted that monsoons may "rush" at 3 miles an hour, it would be impossible to extend the term to the rate at which water has advanced in the sunk valleys of the west of Scotland. One cannot think of anything "rushing" at the rate of a few feet in a century. It is the time scale which in this case is tested and found wanting, and as a result the geography is certainly not real.

6. Perhaps the last instance may not seem to geographers to be very vital. The mistake now to be considered is fundamental and widespread. With a considerable experience the author would say that over 99 per cent. of teachers of geography of all kinds, from those of university rank to students in practising schools, make this mistake, and their pupils naturally go on making it. It is rare and refreshing to listen to a lesson which is not marred by its occurrence in some form or another.

"The Nile flows up to the Mediterranean Sea."

"The Panama Canal is below Mexico in Central America."

"New Zealand is right down in the south-east corner of the world."

"The south of England below the Wash is dry."

"Capetown is at the bottom of Africa."

"Up," "down," "top," "bottom," "above," "below," these are the measle-spots which betray the disease. One may speak quite legitimately in a figurative sense of "going up to town," or "coming down from Oxford," or even "high latitudes," but the phrases given above are far too widespread to be explained away in the legitimately figurative sense. They are mistakes which indicate that the map and the map only is being thought of, and that the real geography is not being thought of at all. The Nile is being seen as a line on a map hung up in a particular manner, not as a river away in a particular direction across intervening lands and seas. As long as such things are said the world is certainly not being thought of as it is.

The attempt is sometimes made of trying to stop children saying such things because examiners or inspectors do not approve of them, though few examiners or inspectors bother their heads about the matter. The cure, however, rather suggests cutting off the spots as a cure for measles. Whether cutting off the spots be a cure for measles or no, merely forbidding the children to use the offending words, is not a cure for this disease. The spots scarcely matter; it is the disease itself, a disease which causes blindness to real facts of geography, which must be cured if any good is to be done.

This disease may take almost as many forms as influenza and may cause equal damage. A reputable newspaper, infected by the disease, on 28th February 1917, made this remarkable statement: "The Tigris immediately above Kut runs south-east for about 4 miles, then there is a sharp bend in its course due south of the same distance, then *against the stream* it goes north." The expression in italics (which are, of course, not in the original) cannot be explained in any legitimately figurative sense. The author, again, has got into trouble even with headmasters, because in a public examination he set a map "upside down." A well-known geographer had a lantern-slide copy of an old map of Europe in which north was shown at the foot of the map and names printed to agree, but when the slide was put on the screen in this position it had to be withdrawn and inverted, "because the audience would recognise it that way." A few years ago, before Ireland adopted Greenwich time, a young woman explained the fact that the time-table showed that a steamer took seven hours to go from Fleetwood to Belfast and eight to return, by first making the error that Fleetwood was north of Belfast and then saying that it was harder to sail "up" than "down."

The disease is widespread, and though these examples may have a humorous side it is really an extremely serious matter. It is from our present point of view the more serious that the disease is horribly infectious and that the pupils are infected to the greatest extent by the teacher. It is of little use trying to prevent the children catching the disease, or trying to cure them of it, before the teacher cures himself or herself. If anyone has doubt as to whether he has the disease, let him try this test. Does he or does he not feel quite comfortable with the map of France, without names, placed in front of him so that the north of the map is nearest him? If he feels inclined to turn the map round so that he may easily "recognise" its "shape," he has the disease, for the real France is naturally visualised from any place in Britain with the north towards one.

If he would further realise the difference between thinking of real geography and thinking of map things, let him imagine he is asking some one to come to see him who does not know the way; he must draw a map to show the way out of the station, the direction in which his guest must turn, and the roads along which he proceeds. Then let our imaginary host insert the cardinal points. He will probably find that in proportion to the clearness with which he is visualising the actual route in his mind when he is drawing the map, his inclination is *not* to put north at the top of the map. He is more likely to put the station from which his guest starts either at the foot or one side of the map and to forget directions altogether. It is only when one is thinking of the map, and the map only, that north is put at the "top."

Here, perhaps, is the place to suggest that only slightly better than thinking of geography as a map placed in front of us so that north is at the top, is what may be called the "angelic" attitude to geography in which one imagines one's self somewhere far removed from the surface of the earth and looking down on what ought to be the world, but what in practice is only a map. It is such an attitude on the part of the majority which raises no protest when a cyclone is said to go round anti-clockwise, whereas if one can visualise the actual movement of wind in a real cyclone on the world, not on a map, from any point on the earth's surface where men live, the real description would be that the motion was "clockwise."

Such an attitude of detachment is unfortunate even when the attempt is made to realise something more than a map. A more satisfactory as well as a more practical view-point, from which in imagination to survey the world, is that place where one happens to be. If the teacher first and then the children could look through maps rather than at them, and would then always consciously attempt to imagine the world as it might be seen spreading away in all directions from the class-room, one of the first difficulties in the teaching of geography would be overcome.

7. So far we have referred only to mistakes which are made in understanding what may be called the externals of geography. When so many mistakes are made in this domain one might expect that more mistakes would be made with regard to the much more subtle relationships of human geography when these are superadded to the mistakes already made.

To the absence of understanding of the scale on which the world is built are added in the following other mistakes, which show that the human actions affected by these geographical conditions are not in the least realised.

"Rome overlooks the west of the Mediterranean Sea."

"Plymouth is able to watch all the strange ships that pass through the English Channel."

"In Manitoba if the summer is very dry they are able to get water from Lake Winnipeg."

It may be wondered what possible use geography can be to young persons of sixteen to eighteen who could make one of these statements. Rome, Plymouth, and Manitoba are certainly not real places to them, and their inhabitants, if they are conceived to exist at all, which may be doubted, are mere puppets. Perhaps an even more serious mistake, though it is somewhat rarer than it used to be, is that which states categorically that the importance of the British Isles is due to their being in the centre of the land-mass of the world. This seems to be a type of the worst kind of lie, a lie of which the premises are true and which on the face of it looks true. A lie which is obviously a lie does little harm; a lie such as this does a great deal. The statement, if it means anything at all, implies, though it does not actually say, that Britain is approached from all directions. This is absolutely untrue. Britain is approached indeed from west round by south to east, to only to a slight extent from north-east, and scarcely at all from north-east round by north to west. Whether economically or strategically it is this latter fact that is fundamental, and a vast deal of the history and geography of Britain depends on a condition of things which may be thought of as the very opposite to that expounded in the statement to which objection is taken. In any case the statement does not represent real geography.

Other mistakes must be more briefly referred to, not because they are of less importance than those already quoted, for the reverse is true, but rather because it would unduly prolong the argument. We have such statements as "England obtained great benefit from the Industrial Revolution, so that there is no fear of any other revolution to take us back to an agricultural country." Many of the mistakes instanced above might be easily paralleled in other lands, but it is doubtful whether in any other country in the world the basic importance of agriculture in all its forms is so little understood, and the life of a farmer so generally spoken of with the townsman's good-humoured contempt not unmixed with an even more ignorant envy.

Allied to this mistake is that which suggests totally wrong pictures of human life. Here one can omit from consideration such remarks (the quotation is from the same series as that from which the others are drawn) as "People in the Sahara travel about in caravans drawn by camels." But one wonders what kind of geographical ideas are in the minds of those who could write "the chief occupation of the inhabitants of Canada is lumbering," "the chief occupation of the inhabitants of Surrey and Kent is hop-picking in summer"; while a report on the scripts of 6000 candidates states that in nearly all of them a farmer in East Anglia was represented as spending a week or two in ploughing, sowing, and reaping wheat, and doing nothing else for the rest of the year.

Then again we may refer to the common error of personalising countries and saying that "Germany does" this, and "France thinks" that, and the "United States wishes" something else. It may be true that the individuals forming the Government of a country may in the name of that country do certain things or express certain opinions, and to this extent it may be true to say that the country does or says certain things. Even so, it is unfortunate phraseology, for it obscures the fact that the millions of individual inhabitants may differ very widely in their feelings and opinions from those who speak and act for the country at any one time, and that very shortly thereafter other individuals forming a Government may speak and act very differently. To speak like this is certainly not teaching real geography.

We are now admittedly on difficult ground; but let us conclude by giving without comment examples of a mistake which is pestilent and widespread in schools and leaves its traces long after school-days are past.

"Britain is a free country, but New Zealand belongs to Britain."

"Canada is one of the countries owned by Britain."

Enough has now been said to establish the seriousness of the position, and it should be noted that the argument could, if necessary, be much strengthened. When one remembers that every pupil of sixteen to eighteen makes mistakes of the kind we have indicated *after* a course of geography, and that most of the mistakes persist through adult life, it is sufficiently clear that to a very disturbing degree geography, as taught, is not geography at all because it does not deal with realities.

CHAPTER IV

THE GRAMMAR OF GEOGRAPHY. PART I

We have discussed the aims with which we teach geography in school. But if we are to be successful in our teaching we must deal with particulars and not merely with generalities. A multitude of particulars is, however, difficult to remember individually, and the significance of each is difficult to understand. We must have a grammar. Grammar is the orderly arrangement of the body of knowledge with which we are concerned in any subject. It is not meant to be interesting, only convenient, like a set of pigeon-holes or a bookcase, for holding things so that one knows where to get them when wanted. And, of course, teaching, as is often the case, should not result in information being heaped up like things in a lumber-room; it should result in information being stored as is a library. There is a great difference: in a lumber-room things are difficult to find; in a well-arranged library one may quickly put one's hand on any particular book.

In order that we may reduce the chaos of a lumber-room to the order of the library, we must have some principles of classification; a grammar is necessary.

Of course there are other grammars besides English grammar and Latin grammar. In England there are still a number of grammar schools. These were established not merely for teaching Latin and English grammar; they were schools where the whole of what was then known was taught in an orderly way. We have had more recently the grammar of science, which means the scheme in which science is arranged. In the same way we require to have a grammar of geography.

There have been several grammars of geography as there have been several ideas of what geography is. There was the very formal grammar of the geography of the last generation, which dealt with boundaries, capes, bays, mountains, rivers and what towns were noted for. This grammar was unsatisfactory because of what it implied as to the content of the subject rather than because it was unsatisfactory in form. Indeed on its formal side as far as it went it was superior to the newer grammars. Everything that was supposed to be classified found a place. What was wrong with it was that it was too narrow: there was no provision for most things that ought to have found a place.

At the present time there are two grammars of geography which hold the field, though others have been suggested. In the past, one has been upheld very strongly in the United States; the other perhaps more in Europe. That which, till lately, has held the field in the United States, and is in use elsewhere, is the grammar which divides geography up into sections —physical geography, economic geography, historical geography, and so on. Each of these is again divided up into different sections: under the heading of physical geography come, for example, relief, erosion, river-flow and meteorology; one learns of the Alps as examples of mountains; of the Dekkan as an example of a plateau. But pupils taught on this scheme have very hazy ideas as to where things *are*; they have very little real understanding of what the earth is and how it fits together. There is now a very strong reaction in certain places against that type of geography.

There is the other grammar—the grammar which takes regions as the basis of geographical work. In regional geography each region is considered as a thing that somehow "belongs together," a thing that has a unity, a thing that means something as a whole, a thing that has got a character, or, as the late Professor Herbertson has it, a *genius loci*. There is a spirit of a place as well as a *Zeitgeist*, the spirit of a time. Regional geography consists in the study of the spirits of places. We realise how the character of one region is different from, or is similar to, that of another region. "As geographers it is our business to discover, describe and explain regional characteristics; it is our privilege to awaken regional consciousness which respects its own traditions and characteristics; it is our duty to cultivate regional consciousness which, while doing all it can for the development of itself, respects the rights of other regions." [1]

The grammar of geography so considered has certain limitations. A man's character is not merely a mechanical compound of this, that, and the other quality; one may analyse a character if one pleases, but one cannot take these qualities which one distinguishes in a man, and put them together and say they make up the man. One cannot even put together the results of a dissection in an anatomical theatre and

[1] Herbertson, *Geographical Teacher*, Autumn 1914, p. 358.

call it a living man. In the same way we must remember that though we may analyse the character of a region, yet the character of the region is something more than the results of that analysis.

We may look at the matter in another way. We have spoken of grammar as a set of pigeon-holes, but it is perhaps better to call it a skeleton, remembering that it is the skeleton of a living thing, not a dead thing. There are such things as dead skeletons, but we have living skeletons inside living bodies. The skeleton is the thing that holds the body together, so that when we speak of a skeleton we suggest that the thing is living; there is perhaps also a suggestion that it is a little soft to start with, and that it grows with the growth of the organism. We wish to suggest also that it is necessary; an organism without a skeleton is not of a very high type. In the same way the grammar must be there, or the geography is not of a high type, and it must grow with the growth in knowledge of geography.

The grammar of regional geography, then, while thinking of the region as a whole, considers each region under some seven or eight main headings. *Structure*, *relief*, *climate* and *vegetation* must be considered. Then there are the distinctly human aspects of the subjects—the *settlement* and *movement* of man. There is also the *economic aspect*, and, finally, what is perhaps the most important, though not by any means universally acknowledged as such, the *historical aspect*.

Even formally it is practically impossible to consider each of these in a water-tight compartment. One cannot easily consider climate apart from relief, nor relief apart from climate. One cannot shut off the economic aspect from the ideas of settlement or movement, or of either from the historical aspect. This need not greatly worry us; even in the grammar of a language it is not unknown to be in doubt as to what part of speech a particular word may be said to be, and, after all, the grammar is made for convenience; when it is not convenient the less said about it the better.

We shall, in the remainder of this chapter, deal with the divisions of the grammar which correspond to what is sometimes called the physical basis of geography, and shall indicate what appear to be the important features of each.

Structure.—The skull feels hard to the touch. In the middle of the face there is something projecting, the nose: it is softer than the skull, but does not "give" easily; it has some definite shape. On the cheeks there is something softer still. Now, as a result of the different proportions of the hard and the soft and the softest in its structure, one's head has a certain shape, it has a certain relief. The relief is the shape, and it is there as result of the structure. In the same way the surface of the globe has acquired a certain shape, as a result of certain events in the past during which forces have acted on the structure.

The relationship of the structure of a region to the other sections of the grammar of regional geography may perhaps be best illustrated if we point out the differences between the geographical point of view and the geological point of view. Let us take a concrete case. Think of the valley of a stream coming down over the limestone rocks of the Pennines in the north of England. The stream drips down over waterfalls, wears back gorges, winds through dales a few fields wide and passes over the plain of Yorkshire to the sea.

The geologist in this area confines himself very largely to the rocky portions of the Pennines, where sections of the country are laid bare, and where he can see the relationship of the different rock layers. If he goes to the plains of Yorkshire his attention is for the most part directed to a few places of special significance, perhaps in order to note sections of moraines left from the Ice Age. The geographer, on the other hand, is not uninterested in the Pennines, but he is much more interested in the lowlands, where more people live, where there are possibilities of life under different conditions, where there always have been greater possibilities of life in villages and towns and cities. He studies the structure even of this area from a different point of view from that of the geologist. He is mildly interested in what the geologist has to tell him of the structure of the Pennines, but he would be much more interested to learn of the structural facts of the plain which affect the lives of many men directly. Unfortunately, it is precisely these facts which it is difficult to obtain. On one region—the coalfield—geologist and geographer have common interests, and the geographer is able to obtain information on points which he considers relevant to the study of his subject. This does not, however, make up altogether for the lack of knowledge on other points. A soil survey, for example, is necessary if we are to understand much of the geography of Britain, but such a thing does not exist.

Now, it is not that the geographer and geologist are thinking of different things; both of them may be thinking of the Pennine Chain and the limestone rocks, the open plain with its soil and its moraines, but the geologist thinks rather more of the upper portions and the geographer thinks more of the lower portions. The geographer thinks not merely of the structure, but of its relationship to other factors in the setting of the world stage. The geologist thinks largely in terms of pure science, as indeed it is necessary that he should do. It follows, however, that structure as expounded by a geologist does not supply a satisfactory basis for geographical work.

Relief.—When we study relief, we are not concerned merely, nor even mainly, with ranges of mountains or peaks. Under the old geography the pupils had to learn the names of the peaks as well as those of the capes and bays, but the new geography is concerned scarcely at all with peaks. Even Mount Everest (29,001 feet) can scarcely be said to have much geographical significance. Its interest is sporting rather than geographical, exceedingly valuable of course, but much more akin to cricket than to geography. Mount Everest has a geographical interest, just as cricket has, but one must not spend time on either to the exclusion of the real subject-matter of geography. When we consider relief, we do not think of these peaks; we consider the great broad stretches of highland and the great broad stretches of lowland. The Pennine Chain is 30 miles wide, with some undulations, but for the most part flat. The Alps are 90 miles across at the narrowest, and 120 miles at their widest, but the highest peak is only 3 miles high. It is with these broad stretches that we are concerned.

We are concerned with relief because it affects man. Even a broad area of upland, especially if there are valleys cut into it, is difficult to cross. Such highlands are important for other reasons; at the height of a few thousand feet the physiological conditions of living are different from those on lowlands. A man requires more red blood to keep him going when living at considerable heights than when living on the plain, and by curious processes the adjustment is made. It is possible that the reputation of the mountaineer for tremendous energy is due to the fact that he has more red corpuscles in his blood than has the lowlander. On his descent to the plain he is for a time capable of more work than normal till again adjustment has taken place. Further, the climate of a highland is different from that of the lowlands on either side. The most obvious difference is that of temperature; temperature changes take place exceedingly quickly as one rises above sea-level. A difference of temperature is obtained in summer by going from London, say, to beyond the north of Scotland, which would be obtained as surely by rising 1000 feet up into the air. Here a thousand feet vertical is equal to about 1000 miles horizontal; a foot up is equivalent to one mile along. This of itself entails enormous differences due to relief, and when all these have their effect, and it is seen that in the highland area there is different food, different surroundings, different habits, different ways of thinking, we recognise that even as a barrier it is not only as a physical barrier that highlands are important, but that they act as a barrier between lowland peoples, because they are occupied by communities of men different from those of the areas on either side. Though this is the fundamental fact it is by no means all that must be considered under the head of relief. Highlands are of many different kinds and shapes, and each has its peculiar effect on man.

Climate.—Something has already been said of climate in Chapter III. Here we may say that the climate of a place consists of much more than its temperature and rainfall. These are really only two of the most important factors. There are others: one factor in climate, which has probably a more direct effect on human well-being than even rainfall, is the humidity of the air. The amount of moisture in the atmosphere affects our comfort very considerably. We sometimes feel uncomfortable in a crowded room; it is probably not the carbon dioxide, as is sometimes imagined, which causes this; it is the moisture in the air which causes the discomfort. The mugginess of a particular day is due to the same cause. Human beings react very quickly to differences of humidity, which is therefore a very important factor in climate, as far as human beings are concerned. Unfortunately it is very difficult to obtain reliable figures by which to compare the humidities of different places, such as are easily to be obtained for temperature and rainfall. Medical men are, however, interesting themselves in this matter, and perhaps more information may be forthcoming.

Temperature and humidity appear to have direct effects on the human body. Notwithstanding that special bodily features tend to remain even when peoples move from their natural home, yet there is an extraordinary correspondence between some race characters and climate. The pigmented skin of the negro prevents the harmful rays of the sun from penetrating to damage the tissues underneath. The skin of the north-western European is thin and unpigmented. There is no advantage in its being otherwise, and the blood-vessels show through and give the ruddy colour characteristic of our peoples. The eastern European, exposed to greater cold in winter, is all the better for a thicker skin, and this thicker skin appears white. The Mongolian in his original greater cold has a thicker skin still, which shows a yellow tinge because of its thickness.

Differences in hair characters also seem to result from differences in climate. The thick skin of the Mongolian is tight, the individual hairs are round in section and grow straight and scanty. The western European has a looser skin ; the orifices through which the hairs grow are oval, the individual hairs are oval also and the hair is naturally wavy. The negro with loose skin and many sweat glands has hair that grows from a curved root and is almost like a ribbon in section ; it is in consequence fuzzy.

The shape of the nose also shows a curious correspondence with temperature and humidity. In cold climates it is an advantage to have a long narrow nostril to warm the cold air before it reaches the lungs. It is not surprising, therefore, that a formula has been worked out connecting the nasal index with the temperature and humidity.[1]

Then there is the question of the strength of the

[1] The nasal index is the ratio of the breadth of nose to the length. The formula is approximately :

$$\text{Nasal index} = \frac{\dfrac{\text{Mean an. temp.}}{2} + \dfrac{\text{Mean an. rel. hum.}}{4} + 25.}{100}$$

wind, another of the factors of climate, which, taken in conjunction with humidity, has a great deal to do with the growth of vegetation and human comfort. In light winds, of course, certain plants will grow which cannot grow in strong winds. There is so much evaporation in a strong wind that plants lose their moisture and die. The bare treeless condition of the western Hebrides, for example, is due to no other factor than the strength of the winds there. The same is true of western Ireland. There are the damp, warm conditions which are favourable to forest growth, and yet there are no forests or even woods on the exposed outer shores of Britain. In the Hebrides there are only shrubs which make a hard fight to live. Even on the mainland, where a few trees grow, it is not unusual to see one apparently bent over to the east by the wind. It is not really bent, but all the shoots on one side have died owing to the loss of moisture by evaporation, and only those on the other have remained alive, being protected to some extent.

Then there are the less important factors which go to the make-up of climate, such as sunshine and the amount of snow. The amount of snow may vary considerably in different parts of the world; it affects human habits and vegetation. Thick snow keeps the ground warm; though the surface temperature of two regions may be much the same, that region where there is most snow in winter may very well have the ground much warmer a foot or two below the surface. Sunshine also makes much difference to men, both physically and mentally.

More important is the distribution through the year and the day of rain and temperature, humidity and sunshine. Places which have the same general average for the year may differ fundamentally. The north-west of Ireland and Astrakhan have the same annual temperature, yet no one could say that there was any similarity between the temperature conditions of the north-west of Ireland and those of Astrakhan, or that the temperature affects living beings in the same way in these two regions. Even the distribution through the day may be important : in one place there may be continually weeping skies without much weight of rain ; in another much rain may fall in an hour each afternoon. Such differences affect man, beast and vegetation directly and indirectly.

One further point must be noted. Wind direction is not a climate factor, however important it may be indirectly. A knowledge of the wind systems is useful to enable us to understand climate, but that is another matter. An east wind of a certain temperature and of a certain humidity will have exactly the same effect on vegetation and human beings as a west wind with that temperature and that humidity. The direction of the wind does not matter. A south wind with the same temperature and the same humidity as the easterly wind will have the same effect ; it is the temperature and the humidity that matter, not the direction of the wind. That does not mean, of course, that one should not teach the wind systems of the world. There is no understanding the climate of the world unless one knows something of the wind systems. Many things must be taught in school that do not strictly come under any particular school subject, but it aids clearness in thinking to note that fundamental causes are not factors in the climate of any particular place.

Vegetation.—The less need be said under this heading as a number of matters have been noted under the heading of climate. Also, if little is here said of the importance of temperature and rainfall that is merely because the importance of these is obvious. It will be more profitable to point out the importance of soil. In theory, the importance of soil to vegetation is recognised. If a child is asked why a particular vegetable product grows well in a certain area, the answer will come at once: "Because the climate and soil are favourable." But while cross-examination may discover some basis for the suitability of climate, it is usually impossible to discover in what respects the soil is thought to be favourable. This is scarcely wonderful for the facts are often not known.

Fertility of soil is rather a complicated matter; it depends both on the properties of the soil and on climatic conditions whether a particular soil in a particular place is fertile or not; the same soil may be fertile in one climate and infertile in another. A sandy soil absorbs a tremendous amount of moisture, but parts with it easily; it tends to have the plant food washed out of it. A clay soil, on the other hand, absorbs water slowly, but it parts with it slowly and it holds much more than does a sandy soil. Also it is difficult to work, both wet and dry. A clay soil heats up slowly in spring and cools down slowly in autumn. Gardeners do not plant early vegetables on clay if they can help it, but they do plant late ones on clay soil. All soil containing vegetable remains or humus holds a great amount of moisture without getting too wet. A similar amount of moisture would make a clay soil impossible for anything but marsh plants.

Alluvial soils and glacial soils are usually composed of many different materials, so that they stand continued cropping; but particular kinds of vegetation may grow best on particular soils (*e.g.* chalk soils) because of particular adaptation, or may grow simply because other vegetation is less favourably situated. Grass might grow anywhere, but, under natural conditions, is choked by trees on some soils, which in other circumstances cannot support trees.

These theoretical facts may be known; the difficulty is to apply them to particular areas owing partly to lack of information and partly to the fact that effects of climate and soil are closely intermixed. As an example of the interaction of climate and soil conditions, it may be noted that while wheat may be grown on the clays in the east of England and not so easily on other soils, yet in the west different conditions prevail. There clay soils are fit for nothing but grass, and wheat is grown on other than clay soils.

But there is another relationship between soil and vegetation. Not only does the climate and the soil affect the vegetation, but the vegetation with the aid of climatic factors actually develops soil characters. Similar soils in similar climatic and vegetation conditions will be developed from different parent materials. The black earths of Russia are developed from materials of very different characters over regions where effective soil moisture is not very much more nor much less than what may be obtained from a rainfall of about 18 inches, and where no trees have grown. Laterites of equatorial lands, on the other hand, are developed where there is a high temperature which decomposes organic matter thoroughly, and a very high rainfall which washes out of the soil the alkali and the remains of organic matter. The surface soil then becomes a light sand, while the subsoil is a heavy clay. Areas covered with laterites make poor grazing lands, medium agricultural lands and excellent forest lands. All this goes to show the extraordinary interaction of structure, relief, climate and vegetation.

CHAPTER V

THE GRAMMAR OF GEOGRAPHY. PART II

So far we have spoken of the physical divisions of the grammar of geography. Theoretically we might have considered these apart from their effect on man, but this has been scarcely possible even were it desirable. We now come to the specifically human sections of the grammar.

Settlement.—In considering the different divisions of the subject we have adopted some kind of logical order. Relief depends on structure to some extent, while vegetation depends on the interaction of structure, relief and climate. But it is difficult to say whether climate should be considered before relief, or relief before climate. When we come to the settlement and movement of man there is the same difficulty. It is desirable for different reasons to consider each before the other, since settlement has followed on movement, while movement has resulted from settlement.

Let us, however, take settlement first. "The rolling stone gathers no moss," and if moss is desired man must settle. Civilisation began, or at least made a great step forward, when man settled even for a short time and began to accumulate property. Then he found it difficult to move on. Even in our own day few folk care to move house often. In making provision for the morrow, in producing things and in storing up from times of plenty to times of scarcity, in beginning to save, man had perforce to settle.

There are two contrasted types of settlement—the scattered settlement of farmers and the close settlement of towns, while between the two is an almost infinite series of different types. Of course the fundamental producers are the farmers; and a real agricultural population is most extraordinarily attached to the soil, and to the soil of one particular spot. In Britain, owing to the dominance of an urban population, we do not appreciate the importance of farmers nor recognise their true place in the scheme of things, either in our own land or in others; but farmers are the backbone of civilisation. The coal exploiting period is after all but an interlude in history, and in most lands except Britain farming is overwhelmingly the most important industry, so that the fundamental importance of producing things from the soil is recognised and insisted on. The teaching of this fact is one of the duties of the teacher of geography.

Farmers are concerned with the chemical processes of life. They provide the most suitable conditions for the natural agencies to do their work. These require plenty of room for work, so that farming settlements take a great deal of space even when the farming has become intensive gardening, as in market-gardens or in oases.

For long, farmers were the only producers on any considerable scale, but slowly other types of production have become of importance. Dwellers in towns, the example of close settlement, are engaged in manufacture and commerce and are thus concerned on the whole with the production of things by the movement of larger portions of matter through greater distances than in farming. They are not concerned mainly with chemical processes, as in farming, but with the work done by hands and machinery.

In primitive times such hand-work as was done at all was largely done by each family and there was no need for close settlement, but with specialisation of function when each man began to be dependent on others to a greater or less extent, the advantage of closer settlement arose, and first villages and then towns began to come into existence. With the accumulation of property there was advantage also in close settlement for purposes of protection. In later days, with the growing use of machinery in large factories, the advantage of close settlement has further increased. So we have now all types of settlement from the extraordinarily diffuse settlement in a dry farming area to the dense settlement in a great conurbation. We must remember that neither in the world as a whole, nor in special regions can we separate into independent communities, or classify the forms of association into the two simple types, "urban" and "country" dwellers.

The possibility of close settlement in towns and of diffuse settlement in the country, with all intermediate types, is related to geographical conditions and to the ability of men to utilise possibilities to the best advantage. In one place it is possible to grow wheat; in another, cotton; in a third, because of coal or water power or business skill, it is possible to manufacture the cotton which is grown elsewhere.

This is of course not the whole story. The advantage of settlement, both close and diffuse, is affected by the possibility of movement over the surface of the earth, and there are in consequence other types of settlement besides those mentioned above. We shall therefore delay consideration of those till we have spoken of movement.

Movement.—In early days and among primitive peoples now, man, before he had begun to accumulate wealth and to settle, had to move from place to place in order to find sustenance. Such movement was not altogether aimless; he moved where he could at the same time move most easily and could find the necessaries of life. But there could have been little in the nature of routes from place to place. With the growth in the importance of settlement, and still more with the development of ordered communities, routes became of importance. Men went by the easiest ways from one place to another if it were only from the village well or shrine to their dwellings, or from summer to winter quarters, and paths were tramped out from one spot to another. With the development of communities some of these ways were adapted to wider needs and formed routes between neighbouring villages, or even between distant regions. The longer ways were made up of the most suitable of the shorter, and gradually the most convenient of these longer routes came to carry the most traffic. Now we have world routes connecting areas of great population on the globe to each other and to less populous regions. The possibility of the existence of those routes and the form they took are dependent on geographical conditions, just as in the case of settlement. One has only to follow a path across a common to see how a furze bush here and a damp patch there have influenced men to step aside to avoid the obstacle. Rivers form obstacles to travellers by land; rapids and waterfalls are impediments to movement on streams. Highlands are always difficult to cross. Men, on the whole, though there are exceptions, attempt to avoid those difficulties as much as possible by crossing rivers at fords or by bridges, and highlands by their lowest passes.

The greatest obstacles both to settlement and to movement have, however, been deserts, forests and marshes. The deserts are of two kinds—cold deserts and dry deserts. In neither will vegetation grow, and there is considerable difficulty of movement, with the result that the Sahara and the Polar caps form the great barriers. Only in oases in the Sahara is settlement possible, and the tundra has a very sparse population.

Movement has again been difficult in the great, and indeed in any, forest areas. In such areas movement has never been easy for individuals, and it has always been impossible for large numbers of men to pass through a forest without straggling. Marshes are always difficult to cross and usually impassable. They form the most effective obstacles, but as there are no marshes comparable in size with deserts and forests they are not of quite the same importance.

The seas and oceans afford no chance of settlement, and for landsmen without boats they form insuperable physical obstacles, while for long the terrors of the unknown discouraged voyages out of sight of land. Movement is, however, possible with less expenditure of energy on water than on land, and once man had reached a certain stage in civilisation, seas and oceans ceased to be altogether obstacles and afforded highways. There are at sea no obstacles corresponding to the forests, marshes, rivers, deserts and highlands on land, and it might be thought that once the oceans were found to be highways movement would take place impartially all over the surface of the ocean. It must, however, be noted that partly because of the existence of cold areas, partly, and specially in the old days, because winds blew steadily in certain directions and unsteadily elsewhere, and partly, specially in modern time, because population is very irregularly distributed round oceans, there is need for routes only along certain narrow tracts. The great routes run over very narrowly defined portions of the seas and oceans.

The conclusion is that men in the mass move along the easiest ways from the places where they happen to be to the places to which they wish to go. But this by no means signifies that no men go by difficult ways. Some men deliberately choose difficult ways as they are attracted by their very difficulty, and even the easiest ways may be difficult in whole or in part.

Now we may return to the question of the settlement which depends on movement. Movement has induced the close settlement of towns much more than the diffuse settlement of farming areas, but by the construction of roads and railways even the latter type of settlement has been made possible where it was not previously possible, and certain areas of diffuse settlement such as the Land of the Five Seas have acquired additional importance as a result of the development of great routes through them.

There are three or four distinct types of town or village settlement dependent on movement. It is convenient for certain members of the community to live in such a position that they can most easily reach any point within a certain area. This means that a village or district or region where routes meet acquires importance. It is at a node. The chief's hut in the village, the chief's village in the group which he rules, the capital of a country where administration is carried on, are most suitably placed if they are in positions where the rest of the community is easily accessible. Religious centres, centres of pilgrimage, and university towns again are more advantageously placed at nodal points than elsewhere. Market towns, whether small or great, whether they be for the collection of produce for its transfer from one middleman to another, or for distribution, are also obviously most suitably placed where roads meet, while, equally obviously, ports exist at points where sea routes meet land routes.

Lastly, pleasure towns of all kinds will be larger if they can be reached by a great number of people than if they are easily accessible to only a few.[1]

Economic Factors.—Of course a great deal of what has already been said is based on economics. In looking for the easiest ways for doing things men have always practised economics. There is thus some overlap between the different sections of the geographical argument. This need not alarm us. Even in English

[1] For a classification of towns by M. Aurousseau, see *Geographical Review*, October 1921. The groups under the following headings are further subdivided (1) Administration; (2) Defence; (3) Culture; (4) Production; (5) Communication, (*a*) Collection, (*b*) Transfer, (*c*) Distribution; (6) Recreation.

grammar, as we have pointed out, there is often a doubt as to what part of speech a word is.

Let us, however, consider the effect of economic factors by taking an example. For the example let us take the story of a cup of tea. It is obvious that when tea is grown it is desirable to have as many leaves as possible. It is not flowers or fruit that are desired; tea is not grown for its stalks like rhubarb, or for its fruit like wheat. We wish leaves, and plenty of them. Under what conditions can leaves grow in abundance? Obviously it is necessary to have a climate in which vegetation flourishes freely—forest conditions rather than those of grass-lands, and a warm forest condition rather than those of a cold forest. There are many regions where such suitable conditions hold—the south-east of the United States, the East Indies, the Amazon and Congo basins, and much of the monsoon lands. Yet tea is not grown in all places where warm forest conditions prevail; there must be some other factor or factors besides the climatic ones.

Tea grows best where a longstanding forest has grown, where there has been plant humus, with clay, sand and lime mixed well together. The tea plant also requires plenty of water, but it must not have any water standing about its roots. It is thus implied that tea grown commercially should if possible be planted where there is good natural drainage on hillsides.

This condition rules out the lowlands of the equatorial regions—the Amazon and Congo basins and many smaller areas unless these can be artificially drained. There still remain, however, other regions which so far seem quite suitable—the Appalachians, much of India, China, Ceylon, East Indies and Central Africa. Yet there is not an ounce of tea grown in the North American Continent, though tea is grown in China in absolutely corresponding conditions of climate, soil, relief and nearly everything of which one can think. The natural conditions of China are identical with those in the Southern Appalachians, or as nearly identical as they can be. Yet in the one case the production of tea is immense, and in the other no tea is grown. There is evidently still some other factor or factors.

There are the economic conditions, the human economic conditions. A pound of tea costs, shall we say, 2s. 6d. a pound, and for this much must be done. Tea must be planted and cultivated, the ground weeded and the leaves picked. Each shoot of the tea plant ends, as most shoots do, with a succession of leaves of diminishing size. Those nearest the end of the shoot are the more tender, and their veins and midribs are scarcely noticed. They are the most valuable. The object of the picker is to pick the last two leaves and the upper half of the third, leaving the lower part of the latter with the stoutest part of its midrib and leaving also as much stalk as possible.

These leaves must be pinched off separately and put into a basket separately. It is to be remembered, also, that as nine-tenths of the weight of the fresh leaves is water, for every pound of tea that we buy ten pounds must be gathered—a leaf at a time. The leaves have to be taken to the factory and put through many processes before tea is manufactured. The boxes must be made, lined, packed and sent down to the coast, loaded on vessels, and shipped across the sea. They must be landed; dock and other charges must be paid. Duty must be paid. The tea must be transported to the shop. Then it is sold for 2s. 6d. a pound. Obviously somebody has to work cheaply. The person who works cheaply is the person who cultivates and picks the tea ; that is a factor which was omitted from our former account. Tea is grown where there is cheap labour. Somebody has to work cheaply for us. When the idea of trade union rates of wages is adopted in the East, we shall pay a good deal more for our tea in the West.

Even so, however, there is another factor still; if cheap labour were the only necessity which we had not previously considered, tea might be grown in the Southern States of America, on the Appalachians, with the cheap labour of the negro.

Now the negro has many excellent qualities ; he has a very excellent pigment in the skin which is most serviceable in sunny countries, but he is not normally extraordinarily neat. The tea leaves have to be picked neatly, and require the neat fingers of such people as the Sinhalese, Tamils, and Chinese; consequently tea is grown in certain restricted areas where there is not only cheap labour but *neat* cheap labour. Not only must the natural geographic conditions be satisfied, but the economic conditions must be suitable, and tea is not grown in parts of the world where these economic conditions do not prevail.

This case supplies an example of the geographical argument almost complete up to a point, and exhibits the influence of the economic factor in geography very satisfactorily. There is, however, one factor in the argument which we have still omitted. That we shall consider in the next chapter.

CHAPTER VI

THE GRAMMAR OF GEOGRAPHY: THE HISTORICAL AND POLITICAL FACTOR

We have considered certain economic factors which must be taken into account when we study geography; but even in the case as given in the last chapter, there is lacking what the author is inclined to believe is the most important factor. We said that the example illustrated the geographical argument up to a point. In this chapter we have to consider the part of the argument there omitted and speak of the historical and political factor, with a greater emphasis on "historical" than "political."

We have already pointed out that while history deals with the drama, geography deals with the stage, and that while history and geography have two distinct provinces they may deal with precisely the same things. One of the functions of geography is to explain as far as possible how it is that the stage is set as it is now; this necessitates some knowledge of how it has come to be set.

We have also said that the very insistence on explanations of geographic facts in terms of natural science is profoundly unscientific. This is because the matter was viewed statically, not dynamically, or, perhaps, it would be better to say that it was viewed physically rather than biologically. The stage has been set not only by natural forces, but by human agency. The actors in the drama have continually left things lying about, and in any land of old civilisation the stage is littered with such remains. Nor is it only that things are left lying about; some have been deliberately placed where they are. Further, many things originating in the past have, during the passing of the years, become in the present something very different from what they were. They are one with the past and yet are not the same. Such things cannot be "explained" in terms of the physical sciences; the "explanation" must inevitably include history. The example given in the last chapter is open to criticism in the form there given, but if the historical factor be taken into account it may be amended and stated correctly. Neat cheap labour is certainly necessary, and neat cheap labour is certainly not available in America. We do not say that the negro is incapable of developing neatness of touch; we do say that as an historical fact he has certainly not developed it yet in the United States.

A "scientific" geography which omits one of the most important factors is not really scientific, and equally a "story of man" geography which takes no account of what man has done in the past to make his environment what it is now, is scarcely humane. We are concerned with the cumulatively overwhelming importance of the past—a past, geological, meteorological, and botanical as well as historical; things are now largely because they have grown to be what they are, and any geography which omits the importance of the past is sadly maimed.

Let us examine this matter in more detail and take first what is a purely physical example, the problem of why the earth goes round the sun. If we consider the matter statically, we learn that there is an enormous force attracting the earth to the sun. We know that the earth attracts even minute objects with enormous force. If one drops such an infinitesimal thing as a brick, it falls at once and strikes the ground with a blow. The sun is to the earth as a globe the height of St Paul's Cathedral is to a small school globe, and exerts a correspondingly greater attractive force. Yet the earth does not fall towards the sun as the brick falls to the earth. It scarcely even changes its direction. All that the enormous attractive force of the sun can do is to prevent the earth from moving in a perfectly straight path; it pulls the earth round so slightly that even when the force is exerted for a whole twenty-four-hour day, the direction in which the earth is moving at the end of the day is less than one degree different from that in which it was moving at the beginning of the day. Why does it change its direction so slightly? There is obviously something else besides the attraction between the earth and sun which affects the earth's motion. This is momentum, or in other words past history. The earth is hurtling through space with all the momentum of the past behind it. If the earth could be stopped dead for an instant it would go straight to the sun. It goes forward in the present, because always in the past it has gone forward, the direction of its forward motion being always modified, though only slightly, by present conditions. Indeed, the answer to the question, "Why does the earth go round the sun?" may be concisely and correctly given by saying, "Because it always has gone round the sun."

This is momentum in the purely physical plane, but it gives an example of a much more widespread phenomenon. The thing that has been—history—influences what is and will be. One hundred per cent. of things that are now, are *where* they are and *as* they are because of happenings in the past, and in most cases in the long-distant past.

Some thousands of years ago, before forests were cut down and marshes were drained, the areas in southern England which were open grass-land were to be found only on the limestone hills of the North and South Downs, the Chilterns, and the Cotswolds. These were the districts where men might live and move and have their being. The movement was for the most part along those heights, and trackways exist now which began to be tramped out in those prehistoric times. If we think of these natural routes of old we see that they tended to converge on to the Wiltshire Downs (fig. 1). Is it wonderful that Stonehenge, the great religious centre, the Westminster Abbey or Canterbury Cathedral of an earlier time, should be just where these routes converge? It was central and convenient. It is neither central nor convenient now, but it remains still, a minor geographic fact perhaps, but a geographic fact left from the past and existing in the present.

Take another example. If one visits the valley of the Tweed and examines the vegetation that grows there, one will find a great preponderance of natural grass-land very much as it has been for thousands of years. Among the grass are many wild flowers, and in the marshes and bogs are others which thrive best in damp situations. There are also, however, cultivated fields. Trees have had to be cut down, or marshes drained, and the land has had to be ploughed and crops sown, grasses and clover and roots. These are not natural vegetation; they have been introduced by man, and they have not been introduced

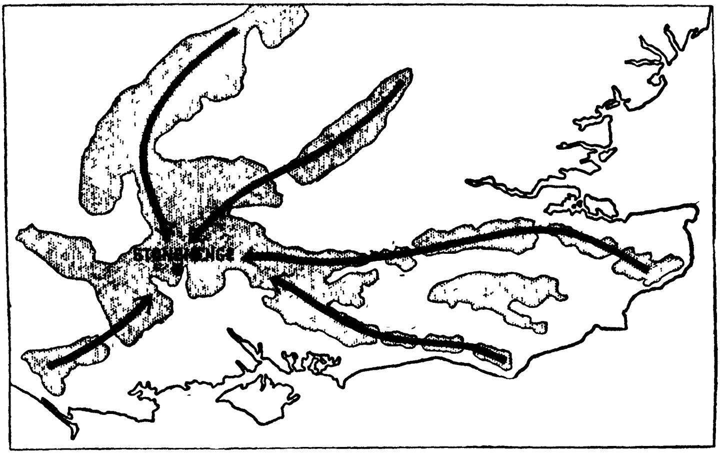

FIG 1.—Map to show the ancient ways converging on Stonehenge.

recently. The land was reclaimed gradually from bare hillside and forest and marsh in the distant past, and has been gradually adapted by successive occupiers to the uses to which it is now put. Among the crops are weeds, wild flowers which would never grow in such profusion unless man had prepared suitable conditions for them. Climate and soil have to be taken into consideration, but these do not do more than begin to account for the existence of the things which grow in the Tweed valley. History counts for much.

Or, again, the boundary between the counties of Surrey and Sussex tells of a time when there were great forests between these counties and of the cutting down of these forests. At first the settlements were on the open lands to north and south, and the boundary between them ran in some undefined way through the forest, but as the trees were gradually removed and further settlement took place, the boundary became more and more precise. The existence of the forest, an historical fact, was the condition precedent to the existence of the boundary between the counties; the exact form of the boundary depends on what men in course of time chose to do to the forest, and on how they chose to do it. The boundary grew.

A more detailed case brings out another point. At the west end of Long Acre in London one finds many premises lining both sides of the street given up to the exhibition and sale of motor-cars. This is a geographical fact. It cannot be explained in terms of physics or mathematics, of climate or relief, of soil or vegetation, or even of economic geography. We must look farther for a clue to the explanation. Just at the western end of Long Acre is a large harness and saddlery business. One of the largest horse-markets in London is close by. A short distance farther west still, we notice in Trafalgar Square the National Gallery, and remember that here close to the King's Palace in Whitehall was the site of the Royal mews. Here is the historic sequence —mews, harness, broughams, motor-cars. It was natural that men, with or without royal patronage, should choose to establish close to the Royal mews businesses where carriages and trappings for horses might be sold. When motor-cars came into use and broughams went out of fashion, it was equally natural that, faced by decrease in business, carriage manufacturers should take in hand the making of motor-cars. They had one extraordinary asset, a geographical fact resulting from history. Here, as probably nowhere else in the world, was a supply of labour familiar with and extremely skilled in all the processes in the manufacture of carriage bodies. The chassis might be made in another district and could here be fitted with a body of a class difficult if not impossible to obtain elsewhere. With such a result to such a tradition it was not wonderful that new motor companies which had never existed before should choose to set up business close to the old-established houses. Here they were sure of buyers on the look out for motor-cars, and here because there was more choice would buyers be all the more sure to come. There had been a market for horse-drawn carriages here, and here a market for motor-cars was set up, or rather grew out of the old conditions. Here we see a real growth, a slow addition and replacement of particles changing the form of the phenomenon and yet retaining an essential identity with the past.

The last case given is but a particular case of a very important fact in history, in economics, and in geography, the persistence of a market. In many little country towns in England, and indeed in other parts of the world, markets have continued under all the changing conditions of half a dozen centuries, and men and women have come to those markets on the same day of the week during all that time. After the war, a gentleman visiting France to see the grave of his son saw, a mile or two away, a small crowd on a bare hillside; the country was still utterly devastated and unreclaimed. There was little or no obvious habitation or cultivation in the vicinity, and the existence of a crowd in these surroundings seemed peculiar and worth investigation. When the spot was reached the weekly market was found in full swing, on the site of what had once been a village. Everything was destroyed except the habit of attending the market at the appointed time and the appointed place. Not even four years of war and a devastated country could put an end to it. The habits of buyers and sellers, and the knowledge that others would attend punctually, attracted men and women and kept the market going.

This idea of a market located in a particular place and extremely difficult to move cannot be explained without a knowledge and understanding of the effects of habit. We have used the phrase "kept the market going." We speak also of a business as a "going concern," when in consequence of work done in the past it has acquired a tendency to continue into the future just as the earth continues to move round the sun, and the same assumption of continuity is made when the goodwill of a business or a doctor's practice is sold. In these cases what is really bought and sold is the habit of customers, those accustomed to go to certain places for particular purposes.

What is true of small things is equally true of great. What is true of a little country market in France is true of a great cotton market in Lancashire. We all know the geographical "explanation" of the Lancashire cotton industry. There are the prevalent westerly winds which bring a damp climate, which in turn allows the cotton threads to be stretched without breaking; there is coal; the country faces America (whatever "facing" may mean); there is a good port, and so forth. These things are all more or less true, but it is evident that there is something radically wrong with the argument, which implies that a cotton industry inevitably follows, if we note that the specification suits equally well the South Wales coalfield where not an ounce of cotton is manufactured. The cotton industry in Lancashire has *grown* out of the past; in South Wales it has not grown, for the seed was never planted. The industry goes on in Lancashire because it is there. If anyone wished to set up a mill for spinning or for weaving, he would certainly set up that mill in Lancashire, not alone because of the advantages enumerated above, but because of other almost more important advantages which have gradually been developed. Here as nowhere else can one find a supply of labour skilled in all the manifold processes through which manufactured cotton goes. Here are those who know how to use the specialised machinery in the mills; here also are people who are accustomed to organisation of business; here is the organisation, the market on a vast scale, by which cotton is bought and sold most conveniently; the banks are accustomed to financing cotton "deals." These things were not there at the beginning: they have grown; but being there they are extraordinarily powerful factors in keeping the industry in Lancashire and in making it difficult if not impossible for a cotton industry to be started elsewhere at the present time, even though, as in South Wales, the natural geographical conditions are entirely suitable.

Or, again, we cannot "explain" the existence of Washington as the capital of the United States in terms of modern geographical conditions. If a convenient site were to be selected now for the capital of the United States, it would probably be somewhere in the northern portion of the central lowland, at St Louis, or Cincinnati, or Chicago. But the capital is not to be selected now. It was selected once for all when particular geographical conditions, man-made and natural, held, and then it was a suitable choice. Now it is not so suitable when even with fast trains Senators and Congressmen take five days or more to reach Washington from their homes in the Far West, when great sections of the country are far moved from the centre of Government, and when public opinion can neither act on nor react to the Government as effectively as if the Government were more central. But there is no suggestion that the capital be moved. The existence of Ottawa as capital of Canada exemplifies also the continuation into the present of the results of similar conditions in the past. Rome is the capital of Italy, not altogether or even mainly because it is the most convenient centre of Government, but because Italians, a generation or two ago, remembering the great days of the Roman Empire, chose to make it the capital of the new Italy.

Finally, we may consider London itself as the governmental centre of the British Isles and of the British Empire. The existence of a high bank on the north side of an estuary "facing" the Continent is of course significant; so also are the facts that the estuary provided an entrance to a fairly extensive valley and that the high bank is central in this valley.

But one hesitates to draw certain conclusions from these premises. The importance of London cannot be explained even by the existence of a ford at Westminster, or by the fact that the Romans chose to make a bridge over the Thames. One can only trace the stages by which London grew to be important, and some of the stages, especially at first, are exceedingly obscure. It was for long a matter of doubt as to where the capital of England should be. There were two valleys opposite the Continent and two estuaries leading to them. For some centuries, indeed, it seemed possible or even likely that Southampton and Winchester rather than London and Westminster should form the twin capital cities, commercial and governmental, of England. Only very gradually did London-Westminster take the lead, so gradually, indeed, that it is impossible to say precisely when the lead was taken or what was the deciding factor. With the union of Wales to England there was no question as to the site of the capital of the whole land. With the union of the kingdoms, or of the parliaments, of England and Scotland, there was never a suggestion from the patriotic Scot that Edinburgh should take the place of London. As if to emphasise the unquestioned importance of London, James came from Edinburgh to rule in London. Nor has even the most outspoken Sein Feiner or Irish Republican ever suggested that Dublin should be the capital of the British Isles, and so long as the British Isles were under one rule, London was the unquestioned capital of the British Isles. When the West Indies and Newfoundland, India and Canada, South Africa and Australia became, or grew to be, constituent parts of the Empire, there was never any suggestion that if there were to be an empire at all, its capital should be anywhere else than London. At no single point in the long story of changing conditions since London became the capital of England has there ever been any doubt as to what would be chosen. London is important now scarcely at all because of the conditions which counted to start with; the high land and the ford and even the bridge count for nothing; the estuary is still of some importance, but the largest vessels cannot reach the city, and even vessels somewhat smaller can approach no nearer than Tilbury.

Though the present conditions are very different from those that counted two thousand years ago, there is an essential continuity of growth which makes the present inexplicable unless the past is taken into account.

CHAPTER VII

POSSIBLE GRAMMARS

WE have now outlined a grammar of geography which holds the field at present. There have been and are other grammars, and it is possible that other grammars still may be formulated. It would take very little, for example, to adapt a portion of the scheme of Professor Geddes' *Ethnological Interpretation of History* to the form of a grammar of geography.

From the United States also comes another suggestion to take social activities as the basis of geographical work. Professor Barrows of Chicago proposes that geography should be looked on as "human ecology," and divides the subject up into economic geography, political geography and social geography. "According to this scheme economic geography would seek to account for those adjustments of man to his environment which are associated with getting a living. Among its subdivisions would be agricultural geography, pastoral geography, the geography of extractive industries (mining, logging, fishing, etc.), commercial geography, and the geography of manufacturing." "Political geography aims to account for such relationships as may exist between man's political attitudes, activities, and institutions, on the one hand, and the natural environment on the other." "Social geography would study the connections that may exist between the social life of peoples and their natural environments." There is much in these suggestions, but to the present writer "human ecology" would seem to be at least as much sociology as geography, and even to Professor Barrows there appears a significant difficulty in deciding exactly what is the content of social geography as distinct from economic geography. It is suggestive also to remember that plant ecology is not synonymous with botany, and it is possible that human ecology is not synonymous with geography.

There is a third possibility. We might develop another idea to which we have not yet referred. This idea underlies the modern conception of one section of the grammar about which it may be as well to speak in a little more detail, namely, physical geography. It will be well therefore to elaborate this grammar of physical geography before proceeding further.

Till recently in some public examinations it was possible to take either geography or physical geography, or both; one was a separate thing from the other. Also physical geography has been treated as if it dealt with entirely unrelated subjects. Volcanoes, lakes, mountains have been spoken of in separate chapters as if they had nothing whatever to do with each other, and as if they were all of equal importance. That is ridiculous. Physical geography consists simply of those sections of the grammar of geography which deal with structure and relief.

Physical geography represents the bare boards of the stage on which the drama is taking place. When we study physical geography we learn how that part of the stage came to take the shape which it has now. The subject is a unity, not scraps. In fact we are dealing with four great processes which affect the relative movement of portions of matter on the earth—*erosion*, *deposition*, *elevation*, and *depression*. Two have to do with the movement of matter particle by particle, the other two with the movement of large masses. These act on the *structure*, the thing that is already there, that has descended from the past.

Erosion.—Erosion is the wearing away of the earth's surface particle by particle. There is nothing dramatic in the process. As I write I have in front of me a stone at which I delight to look. It does not appear dramatic, but I am quite thrilled by it. It is apparently an ordinary pebble such as may be picked up on any beach. Let me describe it. One side is recently broken; indeed I broke it myself. The rest is not broken, the surface is all smooth; it has no corners, for the most part it is very smooth indeed. It is not all made of the same material. The fractured side shows crystals scattered through it; even the material that cements these together is rather suggestive of crystals with larger crystals in it; but when one comes to look at those pieces they are not merely crystals. Though they have flattish sides here and there, all the corners are rounded; even the smallest of them show no sharp angles except where the stone has been smashed clean across; the corners are all rubbed off.

Now, as a matter of fact, this stone is a bit of Harlech grit, one of the oldest rocks in Britain, that is to say, in the world. The rounding of the outside is due to the fact that the waves have knocked it against many other stones; this is as it was found on the seashore. It is composed of smaller pebbles which lay on some shore, how long ago one would not like to suggest, where the action of the waves of a forgotten sea knocked one pebble against another in the same kind of way, and smoothed their corners just as is done now.

Here we must point out that the thing to realise when we are dealing with these four processes, and especially with the first, erosion, is that the really important things that matter are, not earthquakes and volcanoes, which make a great noise and commotion, but those things that are going on slowly without any fuss all the time. And infinitely the most important result is that which is produced by "little drops of water" acting on "little grains of sand," or other matter. We cannot get any drama out of water erosion; there is nothing striking, unless one can see something striking in the fact of the length of time, the continuity and the pertinacity of the process.

Deposition is merely the correlative term. This takes place equally slowly and quietly. Now it is to be noticed that the combined action of erosion and deposition results on the whole in the continued lowering of particles from their previous position. Seeing that things are being continually worn down, and that matter is being carried to a lower level, it is curious that apparently there is more dry land on the surface of the earth now than ever there was. This is because of one of the other forces at work. Elevation and depression have to be reckoned with.

Again, we should not think of earthquakes and volcanoes, even when it comes to *elevation*; it is again the slow imperceptible movements of elevation that are of importance ; occasionally a strain reaches a certain point and there is a sudden movement, an earthquake ; but even so the actual movement may be only a quarter of an inch. Whatever the amount, earthquakes are exceptional rather than normal ; it is the very slow and imperceptible movements of elevation and of its correlative *depression* that matter. In a long life it might be possible to notice some of the most rapid changes ; the water-level on the shore of the sea may be just a little different at the end of life from what it was when the individual was a small boy ; but in general the mass sinks or rises so slowly that no particular person notices any change.

These four processes, then, act on the structure. Now, an idea which has made the whole study of physical geography extremely fertile, is the conception of the *topographic cycle*. It deals with the normal change that takes place on a surface that has been elevated and is exposed to natural erosion by water. In the United States, far more than in this country, there is a tendency to describe land-forms in terms of the stage which they have reached in that normal process of erosion. This is not the place to go into details. But in order to demonstrate how the conception introduces a unity into the teaching of geography, a word or two must be said.

Suppose a country were elevated above sea-level, or *base-level*. There may be deposition, as in a lake, before we descend to that level, but below sea-level there is no erosion of a normal type ; there is only deposition. The erosion which matters, erosion by rain-water, does not have any effect below base-level. The erosion above sea-level produces different land-forms according to the structure and the length of time during which erosion has gone on. Let us suppose first that the land is formed of some homogeneous material. That land, even when it first is raised out of the sea, would not be quite flat; there are certain to be undulations on it. Also we may assume it will slope down to base-level and below. A study of the topographical cycle gives us an idea of the different forms which that surface will take as erosion proceeds. We may assume also, as supplying the simplest case, that the land has risen fairly rapidly, and that there has been little erosion till it has reached its greatest elevation; erosion will start at once to have full effect. The water will run off down the slope in any natural channels that the surface provides, the streams will flow fairly straight to the sea, and the greatest amount of erosion will occur where the streams flow.

After a period, the first thing that will be noticed, then, is that there are little steep-sided valleys cut into the surface just where the streams are flowing; everywhere else the surface is practically unchanged. Everywhere little particles will tend to move downhill with the drops of rain-water; but where much the greatest movement is going on is along the beds of the streams where material is being carried down to base-level (fig. 2, *a*). After another similar period the valleys will be deeper and wider, but the land between them will still be flat (fig. 2, *b*).

A piece of country where there are deep gorges, with comparatively broad flat stretches between, is at this stage of erosion and must have been comparatively recently (as geological time goes) raised to the height at which it stands. This is called a *youthful* type of topography.

As erosion proceeds, these valleys still continue to dig into the surface and will become deeper and wider, though there will still be broad stretches of flat land between them. Sooner or later, however, as the valley bottom approaches base-level, the rate of erosion of the valley bottom slows up, as compared with that of the hill-top, the valley widens rather than deepens, and the flat portions of the highlands become smaller.

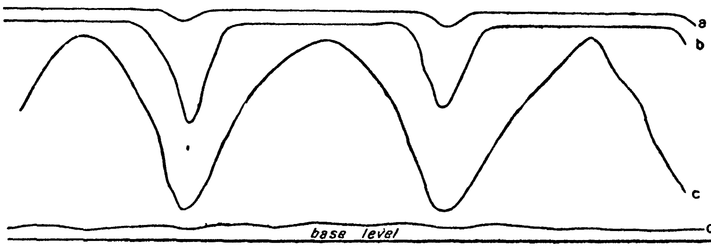

FIG. 2.—Diagrammatic sections to show the relief at different stages of the topographic cycle.

As the valleys widen there are practically no broad stretches of flat land at the top, and a different type of country altogether is produced. Here and there in certain portions of area there may be remnants of previous conditions, but on the whole the country is typically mountainous. It is said to be *mature* or middle-aged.

As the process goes on the mountain-peaks wear down quickly as compared with the valleys, and when the whole surface almost reaches base-level, we have a country in *old age* with very little relief, and with meandering streams (fig. 2, *d*).

It is not likely that such a simple succession has ever occurred; it is too long, especially in its later stages.

The time that elapses at the beginning between the first stages, shown on the diagram, is short compared with the time that elapses between the end stages. Erosion goes on very very slowly at the end.

When we consider structure the complication is greatly increased. Because of differences in deposition the land is not homogeneous, but is composed of layers of different materials more or less irregularly arranged, and eroded at different rates when exposed to similar conditions. Further, though the normal process of erosion by water is far and away the most important, yet ice and wind may play their part, while even erosion by water is different in a dry land from what it is in a wet one. Some interruption generally takes place before the normal end of the cycle is reached; either the land sinks down or is raised, or the level is changed irregularly in some way. If the land is raised, it is said to be *rejuvenated*, for the erosion processes take place at a much accelerated rate. Nearly everywhere we may see evidences of one cycle of erosion taking the place of another, producing ever more complicated land-forms.

The study of physical geography along these lines is most fascinating. We again see the present conditions taking shape as the result of past action, that past action leaving many traces in the present. The grammar of physical geography is seen to deal essentially with land-forms by considering the structure of the land, the processes which have been acting, and the stages of the topographic cycle which have been reached. The apparent disorder has been reduced to order.

This conception of physical geography is interesting and important in itself, but it acquires greater importance when it is realised that the underlying idea may be developed and extended. It is not only the bare boards of the stage that have developed into that which is now, leaving traces of many past periods. The ideas of structure and process and stage of development might be extended to the whole subject-matter of geography. The processes spoken of in physical geography are inanimate, but even land-forms have been modified by living beings [1] and cannot be adequately explained unless the actions of the latter are taken into account, while the rest of the setting of the stage also owes many, if not most, of its present features to the action of vegetation, animals, and man himself.

Each of the elements with which we deal in geography at any stage is the product of the past. Its texture, its form, its warp and woof are not homogeneous. Each element is again acted on by animate and inanimate nature for a certain length of time and takes on a new form. What was there originally, whether it was a mountain or a forest or a kingdom, has a certain *structure* ; it is acted on in a certain way, it undergoes a certain *process*, as a result of which it reaches a certain *stage* of development. The structures, the processes which act, and the stages of development which are reached are all vastly more complex than the corresponding structures, processes, and stages in physical geography, complex though these may be; but there is an exact correspondence, and the idea seems to bring the same unified conception to the subject as a whole, which is brought to that section called physical geography. We see the world as a "macro-organism."

[1] In Britain, in the last century, man has been fifty times more effective than natural forces in changing the shape of the surface.

CHAPTER VIII

GEOGRAPHIC CONTROL

THIS chapter is a short one; it is little more than a note; but it appears well to emphasise here the importance of what has been called geographic control by discussing it in a separate chapter.

We have already pointed out (pages 16 and 61) that the insistence on explanations of geographical facts, in terms of natural science, is very unscientific, and Chapter VI was taken up with showing how things have grown to be what they are. Such pseudo-scientific explanations are not only unscientific, but they leave a totally wrong impression of the reasons for which geography is studied, and, what is worse, they leave a wrong outlook on life.

The implication of such explanations is that geography acts as a compelling force. It is assumed, explicitly or implicitly, that somehow men are forced by geographical conditions to act in particular ways, or that all men with the same geographical environment have always acted in the same way. Thus we find statements like the following constantly occurring in the class-room and even in text-books: "The geographical conditions which decided the woollen manufacture of Yorkshire were as follows," "The forests of Germany cause a large manufacture of toys," "Natural routes meet at X, and therefore X is important." But "decided," "cause," "hence," "and therefore," and even the little word "so" suggest that man is not a free agent. Now, men in the same geographical environment do not always act in the same way. Men at different stages of development or civilisation act in different ways. The elemental facts of the geography of England have been the same for many centuries. Coal was in the ground all the time; it was possible to cultivate the soil. But there have been times when men neither mined for coal nor even cultivated the ground. Neolithic men mined for flints and worked them on the chalk uplands. At the present time many more mine for coal than for flint, though some few still carry on the old flint-knapping industry at Brandon in Suffolk, where it has continued probably for ten thousand years, possibly the oldest industry on its original site in the world. The physical geography of China is very similar to that of the eastern United States, but the whole human conditions are marvellously different.

Let us now take one of the cases we have cited as assuming that men are forced by geographical conditions to act always in the same way, and let us examine the reply usually made. "Here is valley," say the determinist geographers, "so roads run along it; roads must run in this direction and in that, and must meet in this point, and at that point a town must grow up." "Not so," say their opponents; "man is a free agent. Here are valleys and roads do not go along them. You geographers who would make universal laws showing how man must act, do not recognise the infinite variety of men. You quote only one set of conditions and show triumphantly that man has acted thus and thus. Had he acted otherwise you would have quoted other conditions. Man just willed to make a road here and a castle there, and lo! here is a highway and there is the fortress. You might almost call it an accident. There is no geographical control. Man is free. Or, at least, the geographical control is very much less potent than you claim; man is almost free."

Now it is obvious, as we have suggested, that the objections raised against the determinist view are sound; it is perhaps not quite so obvious that the positive statements of their opponents are almost, if not quite, as fallacious as those of the determinists. Man is not quite so free as those who take up the "free" view seem to suggest, and they forget the great variety in the human mind even while they assert the existence of the variety. The differences to be noted in the ways different people act may be due either to difference of conditions or to different reactions to the same conditions because the minds are different. When one allows a developer to act on an exposed plate, one is not surprised that different portions of the plate react differently; nor does one say that therefore the developer cannot be the cause of the difference, because the developer ought to have the same effect on all parts of the plate. A red-sensitive plate, too, will give a different picture from a blue-sensitive one, but one does not say therefore that neither the light nor the developer can have had any influence on the result. Something better is necessary by way of argument than to say that geographical conditions have no effect because some men react in one way to these conditions and other men react in other ways.

Even if some roads run along valleys and others run along hillsides, and there are some valleys with no roads at all, it does not therefore follow that valleys have nothing in the world to do with the existence or non-existence of roads. If Englishmen, on landing in North America, react differently from Frenchmen, it does not evidently follow that neither are affected at all by the geographical conditions to which they at least seem to react. To the geographer the wonder would seem the greater if, with all their past histories, they did react in the same ways. It would be very much more wonderful than if two plates which had been exposed on different subjects should on development show the same picture. Everyone, in fact, does not react in the same way to the same environment; ancient Egyptians and modern Britons and modern Egyptians do not react in the same way to similar geographical conditions in the Nile valley; no one outside a class-room or lecture-room expects them to do so. But they all reacted or react in *some* way.

Where, then, do we find a *via media* between the determinist school and the "free" school? The answer lies in the fact that geography merely spreads out conditions before men. There is no force, there is no compulsion, there is no cane urging men on. Simply there are the facts. Man is allowed to "take it or leave it," as we say; he is allowed to do what he likes with the things that are spread before him, and he chooses to do this, that, and the other. It is a matter of choice. Some people choose the difficult way, not the easy way. Most people would habitually choose the easy way, along the valley bottom if that were the easy way, which it is not always. But even the laziest of men sometimes would choose the difficult way, and there are always adventurous spirits who would habitually choose the difficult path up the mountain, or to the South Pole, even at the risk of losing their lives, as Captain Scott did. We cannot "explain" the reaction of Captain Scott or Shackleton to the Antarctic on any of the ordinary grounds usually quoted with "and therefore" prefixed. They chose definitely and deliberately the difficult way. But, and this is where the geographical control comes in, they could not have reacted to the lure of the Antarctic if it had not been there, if it had not had just those qualities which it possesses, spread out in front of them.

It is in this way that geography acts in all cases. Indeed it does not act; it is passive; it is the reaction of man to the geographical conditions which has to be insisted on. Geography exerts control because it presents certain conditions to man so that he may choose what to do. He chooses to attempt to grow wheat in certain parts of Canada rather than in Greenland or Central Africa, but he did not always choose to attempt to grow wheat in Canada. He chooses now to travel along valleys in England rather than climb hills, but in neolithic times he chose to travel along the ridgeways when the lowlands were forest or marsh. Even in the twentieth century he may choose to make a mountain railway up the ridge of Snowdon when, smitten by mountain fever, he wishes to reach the summit. One of our objects in teaching geography is so to present those geographical facts that people may choose sensibly, with due regard to the importance of the several conditions, and may see that others also have attempted to choose sensibly in their varied circumstances.

Different conditions are presented to similar men, and the choice is different; similar conditions are presented to different men, and the choice is again different. We are not compelled to adopt a certain course, neither are we entirely free; indeed, to sensible beings, the choice is often like that associated with the name of Hobson, as the more we know the more certainly is the choice limited just because we are able to choose the more wisely.

We are impatient of any suggestion that implies that we have not entire liberty of thought and of action. But we shall never reach ideals by neglecting reals. Man has a body, and that body is matter. He is subject to the laws of matter, because that body is matter. He is subject to the laws of life, because that body lives and his mind and soul are subject to law. The law of gravity acts impartially on men and on the earth; if a man throws himself out of a window he falls as surely as a stone. He requires food just as other animals do. We must know geography so that we may be helped to understand just how far we are free. This freedom is in a sense far greater than the freedom of early man, but is greater only because he recognises much more clearly the rules of the game, and in that sense the reaction to any given set of circumstances is the more certain.

I am bound round by restrictions, many of them not geographical; within a certain circle I am free. If I know precisely the limits, geographic and others, of that circle, I am the less likely to kick against the pricks, and the more likely to do work that it is possible to do. Knowing my own limitations I am the more able to sympathise with others who are only a little more or a little less free than I am, and, knowing the limitations of our several circles, I can perhaps the more successfully do my small share in extending them ever so slightly where they may be enlarged.

It is in this spirit that the facts of geography must be taught.

CHAPTER IX

THE TEACHING OF GRAMMAR

WHATEVER grammar the teacher works by, whatever grammar he believes in, there is one general rule as to the teaching of that grammar. It is summed up in Punch's old advice to those about to marry —" Don't." Don't teach the grammar. We have already pointed out that the grammar of a subject is something like a skeleton in a body, very necessary because it holds the body together, that it is living inside a living body, that it is a little soft to start with, and that it grows with the growth of the body; we would now add that the less seen of the skeleton the better. So the less seen of the grammar in teaching the better. There is generally something wrong when it is seen. The important result follows that while there must be a grammar, and though pupils must eventually be conscious of its existence, not only is it not necessary to teach the grammar of geography as grammar, but that it is necessary *not* to teach the grammar of geography *as* grammar.

The important thing in teaching geography, as in teaching everything else, is to remember that we are concerned not with logical order, but with psychological order. The logical order may be quite in place in the university; in the school it has no place. Begin where you can begin, as you catch fish. If you can hook them by the mouth, do that; if you can hook them by the tail, do that; if you can catch them by the middle, do that. No particular way is the right way. As Kipling says: "There are nine and sixty ways of constructing tribal lays, and every single one of them is right." Classes, circumstance, individual boys and girls vary so much that what might be the right way in one class may be the wrong one in another. A way that may be right with a class in one year may be less good with a class at the same stage next year. Some general principles of course there are. It is quite obvious, for example, that one must not start with structure in Standard I, or Standard III, or the corresponding classes in a secondary school. Structure comes in logically at the beginning, but psychologically it comes, if anywhere, at the end. The same is true of details of other parts of the grammar, lines of latitude and longitude, ideas of causes of day and night and seasons. Indeed, "Causes" generally are usually introduced far too early and only help to make geography the unreal subject that it so often is.

This is in accord with what we know of the development of the child. In the first period of his school life he is still at the wonder stage when everything is marvellous and he is prepared to be interested in things for their own sake. He will collect anything from stamps and bird's eggs to numbers on railway engines. He is equally capable of collecting information. In the second period of school life he is beginning to take an interest in facts because of the use they may be to him or to someone else. It is only at the very end of the secondary school course that he really reaches the systematising stage when the knowledge he has acquired is seen to fit in to an orderly scheme or grammar.

The object of the early school course is to supply material in an interesting form, so that it may be possible to suggest a system much later when the need for it is apparent. And it is not possible for pupils to acquire all the facts at once which will make the scheme complete. When boys and girls do not understand certain things miss them out. It may seem a very wrong thing to us to miss out this, that, and the other; the omission may spoil the logical sequence, but if a pupil does not really understand these things there is nothing more to be done but to miss them out. Put in the things that he does understand. This is the first principle.

As has already been stated, the accepted method of teaching geography is that, with the exception of a few interludes in which important minor matters are considered, different regions of the world should be studied successively. That does not mean to say that every region must be treated in the same way; very much the reverse. Regions should be treated in different ways and should be shown to be different as well as shown to fit into a general scheme, otherwise it will not be possible to leave the impression that each part of the world has a character of its own, that there is a *genius loci*, a spirit of the place, to which we have already referred.

Let us take two regions and contrast them. Suppose we are trying to teach the geography of, or to use the accepted phrase to "do," Asia. The Siberian Plain must be considered. What is its characteristic feature? It is flat, obviously. The different parts of it may be most easily distinguished by different types of vegetation as we go from south to north. The north and the south are both deserts where little grows. The north is cold, the south is hot; the north is damp, the south is dry. It is the cold in the north and the drought in the south which are the determining facts in the climate. To the north of the southern desert there is just enough rain for grass to grow; here are the steppes. South of the tundra are the forest regions. Between the steppes and the forest is the land which is most easily exploited, the belt which it has been possible to use most easily for agriculture. This is the district which has been used by man to the greatest extent. It is the belt along which most movement takes place. The vegetation supplies the keynote and the whole story may be developed round the vegetation.

Contrast the Siberian Plain with the Land of the Five Seas—the land between the Caspian Sea, the Black Sea, the Mediterranean Sea, the Red Sea, and the Persian Gulf. It is a very different land from the other. It is mostly highland; there are few lowlands. It is a difficult land in all senses. It lies between Europe, Asia, and Africa. It is a land lying between 400 millions of people in Europe and 800 millions of people in Southern Asia. It is the land through which routes between these peoples *must* go. The natural routes supply the keynote. The land is of importance and must be of importance, desert or fertile, because of these routes, and the geography of the land may be built up round these routes.

Now, if the Land of the Five Seas and the Siberian

Plain are studied, according to exactly the same mechanical plan, the impression is left that somehow or another they are similar, when as a matter of fact one can scarcely think of them in the same compartment of one's mind, they are so extraordinarily different.

Different regions, then, are taken successively and in different ways in order to bring out the essential characteristics of each, ideas being introduced as and when they become suitable for the children. For example, at the beginning the geography should have a human bias, while, later, other ideas have their place. All this obviously implies that a coherent scheme must be evolved, so that the teaching may be progressive, and what is learned of one region may aid in the understanding of those taken subsequently.

There must, in fact, be purpose behind the teaching syllabus. Perhaps it would be better to say that there must be a teaching syllabus and there must be a purpose behind it. It is not sufficiently recognised that a teaching syllabus is a very different thing from a syllabus of work. The former differs as much from the latter as a detailed account of how a motor-car is built differs from the specification of the completed car. The syllabus of work merely states what must be "covered" in a given time; the teaching syllabus shows just how and where this, that, and the other of the innumerable details with which we are concerned is going to be first suggested and taught and revised and re-revised. On the face of it such a syllabus may look scrappy, but it has only the same amount of scrappiness as has the motor factory or any other place where work is done, and there need be no more disorder.

Now let us take definite examples of ways in which details are fitted into their places in a regional scheme. It will be convenient to take them from what we have called physical geography, as we may also say a word or two on the whole question of the relations of physical geography and regional geography; but it should be noted that what is said applies, *mutatis mutandis*, to the teaching of economic geography or historical geography.

It must be emphasised in the first place that physical geography is not to be taught as a subject by itself in schools; what happens in universities is another matter and does not concern us. Physical geography must be taught, the facts of physical geography and ideas of physical geography must be taught, but in any scheme of school geography the facts and ideas of physical geography must be taught subject to certain limitations. In the first place the subject must be correlated, each separate section of it, to the regional geography. Nothing essential, which children can understand, must be omitted. Secondly, each particular section of physical geography must be taught in connection with one of the regions which best illustrates the important ideas in that section. Thirdly, and perhaps most important, each section must be taught when the children can best understand and be interested in it.

The problem thus presented is quite a pretty one, and it has not yet been solved. Some people have made attempts to solve it in particular schools, but that is as much as can be said. Satisfactory solutions of the problem will be found only when many people have propounded solutions, and these have been tried out.

Some suggestions may, however, be given as to the circumstances in which certain subjects may be introduced or omitted. It is a pity, for example, to have a lesson on volcanoes, if, indeed, volcanoes need be introduced at all, except on a hot July afternoon when the children are going to sleep and something exciting is demanded; volcanoes are warranted to keep any class awake.

Elementary ideas of erosion and deposition may be introduced very early, in terms of local phenomena. Even the gutter during a shower may serve as an example. The ideas so introduced may be amplified and emphasised successively in terms of a stream from the Pennines and the dale it flows through, a Highland glen, an Alpine valley, and the valleys of the greater rivers of the world, particular cases being used as different regions are studied.

Different land-forms resulting from erosion are referred to as they are met with in the study of the regional geography and are compared and contrasted with those already known. The appearance of the Pennines may be described as simply as possible and some comparison made with heights nearer home which are known to the children. When the Lake District is studied in its turn, there will be not only description and comparison with the home area in order to obtain some understanding of the scale on which the hills are built, but there will be some comparison with the Pennines in order to suggest that the land-forms are different in the two regions; both regions will gain by the comparison. The Highlands of Scotland again are described and compared with the Pennines and with the Lake District in order to bring out similarities and differences so that each is seen to have a different character. As other regions of the world are studied, the method holds of combining description of each region with comparison with regions already known.

Deposition will naturally come in for special study in connection with the alluvial plains of, say, North China or North India; but the way for this may well have been prepared not only by the gutter experiment, but by the study of some stream or pond or lake nearer home than the Orient. The flood plains of any of the great rivers, like the Nile or the Mississippi, and of many smaller ones, the selection of which depends on special circumstances, supply abundant cases for the revision, at suitable intervals, of ideas of phenomena of a slightly different order, as the regions in which they occur are studied. The work is much better understood than if everything about rivers and river action were compressed into a term or year devoted to "physical geography."

Deltas are more complex phenomena and require more careful treatment than is usually accorded them. The fact of the existence of deltas may come quite early; the mode of formation will come distinctly later as more advanced ideas are introduced by the study of the influence of the existence or the non-existence of tides and tidal currents on the rate of settlement of material suspended in water. It may here be pointed out that the explanation of deltas is usually given in an incomplete form; it is not at all obvious from the stock explanation how sedimentation in water can produce a surface *above* the water-level. It is part of the legacy of the older pseudo-scientific geography which tended to explain things entirely in terms of inanimate phenomena that the extraordinary and indeed overwhelming importance of the part played by vegetation in the later stages of the growth of a delta is, to say the least, unduly minimised.

Glacial action will naturally be introduced for the first time much later than river erosion, though that is not to say that the appearance of glaciers may not be made familiar to the children by pictures very much earlier than their effects are studied. The emphasis should indeed be placed not so much on glaciers as on ice-sheets, not so much on moraines as on till, and the effects of glacial action on a large area like a country rather than on a valley, though, again, particular instances are dealt with. Such action is again well studied in Scotland and Norway and, in the different effects such action may have under different circumstances, in New England and the Central Plain of North America.

The questions of elevation and depression may be dealt with in ways similar to those already suggested. The effects of the sinking of a coast may easily be introduced in connection with Scotland, Norway, British Columbia, or New Zealand, whichever is most convenient, and may be revised as other regions are studied. The effects of raised coasts are equally well discussed in connection with the west of Scotland or Norway, and these lands may be contrasted with the south-east coast of the United States.

For the primary school and for the junior classes of the secondary school, it will probably be found that except in special situations the method of description and comparison will be sufficient, *i.e.* only the relief need be considered. In the upper classes of secondary schools, however, structure may be dealt with, and where this is to be done it may not be out of place to make some simple preparations for this work in the lower classes. It may, for instance, be suggested that some of the difference between the Pennines and the Lake District depends on the difference in the ways in which the rocks lie.

Later, the effect of the structure on which the processes act may be more definitely studied. Again Britain supplies examples of much that is necessary in the simple case of the scarp-lands of central England, the classic fold of the Weald, or the somewhat more complicated fold of the Pennines, while ideas may be further extended by the study of folds elsewhere, *e.g.* in the Alps or Himalayas. The details of the shapes of valleys as related to the structure are brought out in particular cases. The differences between transverse and longitudinal valleys may be noted in the Weald or in China, in the valley of the Thames, or in the valley of the Rhine. At first it will be well merely to point to the curious fact that broad open valleys alternate along the stream with narrow gorges; when the facts have had time to sink in explanations may be suggested.

We have mentioned by no means everything which ought to be or might be incorporated in a school course of physical geography, but we have said enough to indicate the principles which should be kept in mind in framing the teaching syllabus. We must, however, again state emphatically that while these facts are to be taught as more or less isolated facts, as far as physical geography is concerned, they will take their ordered places in the setting of each region, and further, that they should be taught in such a way that there is a growing consciousness in the pupils that things do fit together.

We have now seen that while the study of geography is based on regional work of some kind, yet the study of each region must be different, not merely because the regions have different characters, but because in practice different geographical ideas must be developed as they become suitable for the understanding of growing youth. The question of how and where particular ideas may most suitably be introduced is also conditioned by the fact that geography is related to other subjects of the curriculum.

Geography as a subject is, as we have pointed out, both scientific and humane. It is related, on the one hand, to physics, botany, geology, geometry, astronomy, meteorology and anthropology, and, on the other, to history, economics and even literature and language work. It is the duality of this relationship which is the strength of geography and its weakness. On the one hand no other subject gives quite such an all-round outlook. But there is the other side to the question. Not only has its dual relation led to administrative difficulties in school and university where subjects are deemed to be *either* sciences or arts, but its very intimate connection with so many other subjects has sometimes led enthusiasts to say that geography is all-embracing, and detractors to maintain that geography is made up of the odds and ends of other subjects, and that though each of these other subjects has a geographical aspect there is no subject of geography. Both views are fallacious. The mistake in each view, indeed, arises from the same cause, the difficulty of saying just exactly where the dividing line lies between geography and each of these other subjects. It may be pointed out, however, that while it is difficult to say just where the blue of a rainbow shades off into violet on the one side and green on the other, yet one does not therefore say either that there is no blue, or that green and violet are both included in blue.

The same difficulty to a greater or less extent arises in connection with all divisions of human knowledge. It might equally well be argued that there are no such things as history or as botany. It might be said, for example, that history is the historical side of politics, law, military strategy, economics, geography and literature, and might be taught in the process of teaching those subjects. It may be true that most of the facts of history might be so taught, but there is no doubt that the peculiar contribution of history to education would be omitted, the inculcation of the solidarity of the human race, past, present, and future, and there is the practical difficulty that, as at least politics, law and military strategy are not taught in schools, a number of the important facts of history would be omitted, and the real importance of the rest would be obscured. In the same way geography is an entity, even though it may be difficult to say just where its boundaries are, and the difficulty is increased because it touches so many other subjects.

This is all of supreme importance because it determines *what* we are to teach. But the extraordinary variety of relationships of geography with other subjects has results in other ways which are important. They make it particularly difficult to decide *how* the grammar of geography should be taught.

It may have effects in the actual lesson form. A course of lessons in geography must be built up lesson by lesson, as a house is built brick by brick. Now, whatever is true of the raw materials of architecture, lessons should not be identical. From the nature of the case they are different. It is necessary, too, of course, that they should in fact go to build up an edifice, and not be merely thrown together as a confused heap. It is just because geography has such a variety of relationships that we may take such a large variety of topics to give coherence to individual lessons, since these topics may be chosen from such a number of subjects. The answer to the question, "What do you do when you want a drink of water?" may in some classes form the basis of a much more interesting and fruitful lesson on the rainfall and the water supply of Britain, than if the rainfall were worked out logically and relentlessly. The story of the ways by which different peoples have entered France in the last two thousand years may not only be good history, but may form the basis of an understanding of the relief and routes of the country.

But this is only one aspect of the case, and a minor one at that. The real importance of the extent of the varied relationships of geography depends on the fact that the teaching of geography may be correlated with the teaching of so many other subjects. Of course correlation may be overdone, as in the case of the kindergarten where the children had a lesson on a daffodil on Monday, and drew a daffodil on Tuesday, and painted a daffodil on Wednesday, and sang a song about a daffodil on Thursday, and danced a daffodil dance on Friday—and cursed daffodils for a long time thereafter. But correlation both within a subject and with other subjects is, if sensibly worked out, a great saving of time. For example, it is an old idea that pupils may occasionally have geographical subjects for their English "compositions" or "essays," but it may be pointed out that the value of the exercise is quadrupled if two sets of marks are given for it, one set valuing the exercise as an essay, and the other as a statement of geographical facts or ideas. This may seem an unusually generous action on the part of the teacher, but what in fact happens is that the pupils discover that the geography is not considered satisfactory unless the English is good, and that the essay is not considered satisfactory if the geographical facts are wrong or inadequate; they discover that an essay does not consist in saying things nicely about nothing.

This correlation of the teaching of geography and other subjects introduces the condition that certain geographical "elements"[1] cannot be studied in a particular way till some work on which that study depends has been taken in another subject. It is of little use beginning the formal study of geography at all till the children have a certain facility in reading and writing; it is of little use studying pressure maps till the barometer has been studied in the physics course. Many of the facts regarding the distribution of vegetation may be made much easier to understand if there has been a previous study of botany, and it is obviously an advantage to delay the study of those

[1] The term "elements" is a convenient one to denote the fundamental units with which we deal in geography, *e.g.* annual rainfall, mean temperature, glacial action, town sites.

facts till a certain stage in botany has been reached. Structural work, again, should be delayed till pupils know a certain amount of geology, and similar considerations apply to history, economics, and astronomy.

There are here obviously two different sets of problems according as the correlated subjects are or are not taught in schools. Geology, astronomy, and economics are rarely taught as such, and botany, while common in girls' schools, is rarely taught in boys' schools. What is to be done in these circumstances? The answer depends partly on the particular interests of the teacher, but in general it may be said that if adequate understanding of certain ideas fundamental to geography is to be given at all, it must be given by the teacher of geography, not because the subjects spoken of are geographical, but because there is no one else to do the work.

There are certain topics also which are very much on the border-land between two subjects, of which geography is one, and there may be considerable differences of opinion between specialists as to whose duty it is to teach them. A whole series of topics relating to the mathematical side of map-reading, from the survey of small areas through triangulation to map-nets, may apparently come under either geometry or geography. They may appear really to be more geometry, which is fundamentally earth measurement, than geography, but if the matter does not present itself to the mathematical master in this light, then, if they are to be done at all, they must be done as geography. The golden rule indeed is to get other people to do as much as possible and to do as little as possible oneself. Even when all possible adjustments are made, there will be still much more than enough for the geography course. If it is possible to get subjects on the border-line between geography and physics, or between geography and history to be dealt with in the periods allotted to these latter subjects, it may prove impossible to beguile the mathematician; if the mathematician and physicist are complacent, the history specialist may be obdurate. Even if everything goes smoothly, and all border-line subjects are taken care of elsewhere, there need be no lack of work for the geography lesson; rather will the real geography work be improved.

Supposing things have gone smoothly, let us take as an example of the way in which correlation works itself out, the order in which the chief ideas about rainfall may be presented. Every child knows what rain is, and very early indeed in the geography work it is easy to suggest how exceedingly important rain is for vegetation. Quite young children may be brought to see this importance and to take an interest in the facts. For the sake of definiteness we may say that this may be done by the age of eight.

For the next few years frequent reference will be made to rainfall and its effects. Some idea of the variation in the amount of rainfall in different places may be given, but it is impossible to make the measurement of rainfall precise till the mathematical work has been advanced to the stage when pupils learn something of the principles by which the area of a circle and the volume of a cylinder are found, so that the working of a rain-gauge may be understood. Again, for the sake of definiteness this may be taken at the age of twelve or thirteen, and then precise comparisons of the rainfall in different parts of the world may be made—a very considerable advance.

Nor is the advantage all on the side of geography. The very fact that there is an interest in rainfall, and that the area of a circle and the volume of a cylinder are studied for a definite practical purpose, gives at least one reason for the study of these things. Further, when the mean rainfall for successive months of a year is plotted, it must be plotted in a series of steps because we are working with periods *during* which rain fell, not, as usually with temperatures, times *at* which the temperature has a certain definite value. This step curve supplies an example of a way of approach to the study of the differential calculus.

But even when the measurement of rainfall has been made precise, we have done by no means all that may be done with the subject. The causes of rainfall involve more advanced ideas than it is possible to introduce before the age of fifteen. Some elementary notions may, of course, be given early in the course. Water may be shown to be evaporated from a saucer [1] left exposed to the air, and droplets may be seen to be condensed on a cold body brought into a warm room; in these ways ideas may be given of evaporation and condensation. Later, knowledge may be utilised of the fact that has been learned descriptively, that temperature falls as height above sea-level

[1] This may be done very effectively by leaving the saucer and telling the children not to touch it; then in a week's time the teacher appears very angry because "someone has thrown the water away." If, as usually happens, the children accept the rebuke, the saucer may be again left with very definite instructions to be sure to leave it alone. The children will then watch carefully and discover that it disappears gradually.

increases, and some kind of suggestion given of the reason for the occurrence of rainfall on exposed slopes. But adequate explanation can be given only when at least some rudimentary notion of adiabatic (the word, of course, need never be used) expansion has been acquired in the physics course. When it is realised that it is the rising that causes the cooling, not only are the causes of apparently peculiar rainfall distributions understood, but the fact that temperature decreases with height is also explained. Such studies are best taken round about the age of sixteen.

Progressive work with rainfall is then seen to cover the whole school course, being correlated with work in both mathematics and physics at definite points. The pupils should in this particular case, as we have already suggested, have a growing consciousness that things "fit together."

The skill of the manufacturer of motor-cars is seen not only in his having all the parts made separately, but in so arranging matters that they converge just where they most easily may be fitted at first into sections and then into the completed car. So the skill of the teacher in framing the teaching syllabus is seen not only in arranging that all the parts of the syllabus are covered, but that the parts are covered in such a way that they build themselves up in the pupil's mind into one coherent idea.

CHAPTER X

MAPS

After the discussion of "what" and "why" and "when," there comes "how." We have discussed "Why do we teach geography?" "What is the geography that is to be aimed at?" "When must certain ideas be introduced?" Now there is the question, "How are we going to do it?" In a book on methods of teaching the subject this may seem the most important part of the volume, and all that has gone before merely rather irrelevant padding; but if one knows what has to be done, a way will be found of doing it; so that "what" and "why" are really more important than "how." To consider "How has this to be done," before considering the "why" and the "what," would be putting the cart before the horse.

Of the "hows," none are of more importance than maps, and in the following chapters we shall speak of maps as *the* means by which geography may be taught and learned. In fact, it may be said that the advance in teaching geography which has been made in the last twenty years, has been associated with an increase in the use of maps and of map-work. It is probably true to say that 99 per cent. of geography can be put on a map. There is only about 1 per cent., a very small part of geography, though it may be the most important part, that cannot be represented on maps.

That being so, and geography dealing with space relations on the surface of the globe, it is quite obvious that maps, which show these space relations in a better way than they are shown by any other method, are bound to be of enormous importance. Kipling once made a statement which, if not altogether exact, yet contains a vast deal of truth. He said: "I do not assert that it is impossible to hold intelligent conversation without the help of an atlas, but I do say that as soon as men begin to talk about anything that matters, someone has got to go and get an atlas." The map co-ordinates things that it is extraordinarily difficult to imagine otherwise than with the help of a map; it gives precision to ideas of space relations. Without the aid of a map we know that a place is somewhere over in a certain direction; with a map we can tell exactly where in the given direction the place is, how far away it is and what lies between; we can imagine, if we take the trouble to imagine, accurately. This is the fundamental use of the map, and it is of striking importance.

If one were to go out of London to High Barnet, and then proceed northwards, one would come to the Barnet Pillar, which marks the site of the Battle of Barnet. Here the road divides. On the right-hand of the Pillar is the main road, well macadamised, tarred, and carrying a great deal of traffic, and on the left-hand what is at present a country lane. But at that Barnet Pillar is the dividing of two great ways—one way leading to Scotland, the other to Ireland. The one, the Great North Road, goes north through the plain of York round the end of the Southern Uplands, into Edinburgh; the other goes through the gap between the Welsh mountains and the Pennines; and just there at Barnet they are pulled apart. People bound for Scotland and Ireland left London by one road; sooner or later their ways had to part, and here is the parting of the ways. The geography of the north and west of Britain is felt at Barnet Pillar. This is obvious, but it is not at all obvious unless the relations of the geographical facts have been made precise by a study of a map of England. One might have walked over the length and breadth of England, but it would have been a long time before one would have realised these relationships precisely without maps.

Maps are, then, of enormous advantage. And yet, they may be more of a hindrance than a help in teaching. The trouble is that they teach wrong things rather more easily than they do the right ones, and when badly used they have such an effect that they seem to become a veritable curse.

Examples have been given (Chapter III) of mistakes which are due to inaccurate imagination, and it will be remembered that in almost every case these mistakes may be traced to the use of the map, to thinking of the map instead of the reality behind the map; to worshipping the symbol instead of the thing for which it stands; to worshipping, very literally, the graven image forbidden in the commandment. That is a very grave indictment of maps as used in teaching. The charge is this—that a great deal of geography is thought of in terms of a map only, not of the reality. At the best, much of geography is thought of on the map and is then retranslated into terms of actuality. At worst, of course, things are not thought of at all in terms of the actuality; it is merely the maps that have been seen. They do not represent anything real, they are merely curious marks on paper. A vast part of so-called geography is merely map knowledge not retranslated. This is not geography; it is not the geography with which this volume deals. If the map comes in the way of the knowledge of all the things that one desires to learn and teach, it is doing great damage.

Let us examine the matter in more detail, and consider why maps give wrong impressions. Maps are wrong in four main ways:

1. In the first place the map is flat, and the world is round. For the study of many things that does not matter; people learned a great deal of geography when they thought the world was flat; a great deal of good geography was learned and understood. The Romans, for example, had an extensive knowledge of geography, and they thought the world was flat and went down solid to the bottom of things. But they must have imagined Britain very accurately to make their roads as they did; these roads do not run haphazard all over Britain. Look at the road from Westminster to St Albans. This road, though it has two long straight stretches, is not as a whole quite straight, but the direction in which St Albans lay was known fairly accurately. It starts as the Edgeware Road, and makes at first for the hill to the west of Elstree; it runs straight, avoiding all the side hills on the way, and in the old days before the smoke of London dimmed the air, the top of that hill could be seen on a fine day from the ford at Westminster. The Romans, possibly, made a smoke signal from

the hill to give a point to which the engineer might align the road through the forest. St Albans, or rather Verulamium, could be seen from another hill close by, and another straight course was possible. A short stretch then connected the two hills (fig. 3). It is obvious that the Romans had pretty good ideas as to the directions in which roads had to be made, even though they had no maps and to them the world was flat.

FIG. 3.—To show the route of the Roman Road from Westminster to St Albans.

There are, however, some things about geography that it is well to know, and the fact of the rotundity of the world, especially in these days when it has become effectively one round whole, is one of them. This a map does not teach. But a belief in the flatness of the earth is perhaps the least of the mistakes that are picked up from a map. It is a subsidiary result that is most important. As the world is round it is impossible to show it satisfactorily all together on one map, with the result that in an atlas only the continents are shown, and the oceans making up four-fifths of the globe are omitted. In consequence of this it is natural that misconceptions arise as to the relative positions of the great land-masses and their directions and distances from each other. The fact is scarcely recognised, for example, that the shortest distance from New York to Peking lies across Bering Strait. The route to New Zealand also by the Suez Canal is almost always thought of as shorter than that by the Cape, and the route *via* the Panama Canal as shorter than that by Cape Horn, the fact being that there is very little difference in actual mileage between the four.

2. Then there is this very fundamental disadvantage; a map, especially a wall-map, is hung up to be looked at by a class, or is put in front of a child on his desk, and the north is almost always at the top of the page, so the children get the idea of "up and down." It is not necessary to emphasise this again after what has been said in Chapter III, but it must be repeated that thinking continuously of the wall-map from the same point of view is very demoralising in teaching. It is only when one is quite happy on looking at a map of France from north, south, east, or west that one begins to know geography. One may not have begun to read a map, but one has begun to spell it.

3. Maps have another disadvantage in that they are small. Many mistakes arise from the maps of the world being small; people acquire curious ideas of the relationships of places. "From Heligoland you can see the North Sea and the Atlantic," said one sixth-form girl. Places really a long distance apart

are thought of as close together. The size of the world is not realised.

4. The fourth disadvantage also arises from the fact that maps are small; they cannot tell the whole truth; there is no room to insert everything, and the result is that one of two things happens. Either things become very crowded, in which case one can see nothing, because there is so much on the map, as, for instance, on some sheets of the 1-inch Ordnance Survey maps of Britain; or something has to be omitted. When things are omitted only part of the truth is told; some points are emphasised at the expense of others, and again there is a fruitful source of misunderstanding.

These are the facts. What is to be done? We may perhaps be so obsessed by the difficulties of using maps as to do without them like the Romans, and to learn geography without maps at all. Much more than might be thought possible can, indeed, be done without the use of maps in teaching actual space relations. Much may be done without maps, even in the class-room. Of course, also, a great deal of excellent geography is learned by actually seeing things. That, indeed, is the way to learn geography, through the feet rather than the head. The more that can be seen by moving by tramcars, motor-cars, aeroplanes, trains, or, best of all, on one's own boot-soles, the more experience one has of seeing things, the more maps mean and the less they are an obsession. A great part of the world might be learned in this way without a map at all.

But this is not altogether a satisfactory solution. Notwithstanding what has been said of their defects, maps do not necessarily teach wrong things. The real aim in using a map is to look at it and imagine something which shall be not *too* unlike the reality. The problem is how this is to be brought about.

Let us see what is done in an almost exactly similar case. We speak of map "reading," and there is considerable similarity between learning to read ordinary print and learning to read a map. Maps bear the same kind of relationship to geography that books do to literature. Now, it is quite possible that a literary man—Homer, for instance—might compose literature without ever having put pen to paper; it is quite possible he did. It is quite possible that, even at the present day, a man who is possessed of great thoughts should dictate his masterpieces to somebody else; even so, it is more than likely he himself would be able to read and write. Some people do dictate their great thoughts, and have them taken down in shorthand and reproduced afterwards; books have been written that way, but if the ordinary person is to write books or understand literature, he must learn to read and write, he must learn his letters. In the same way if he is to learn geography, he must learn to read maps. He must learn to read a map in the same way that he learns to read a book.

There are three main stages in learning how to read. The first stage is not taught in school at all; it is taught elsewhere. Boys and girls learn to speak, to say what they want, in very simple language. They have to reach that stage before they come to any school, before they are taught to read. At the next stage they are introduced to very simple symbols for the very simple words that they use, and then at the third stage they are introduced to more complicated ideas by means of these symbols that they already know.

Perhaps the most important stage is the second, where the child finds curious lines like " C " " A " " T," first a broken curved line, then two straight lines meeting and joined by a shorter one, and then another straight line with a shorter one across its top. When first introduced to these things, the child sees merely the symbols. Then, as soon as it can possibly be done, those symbols must be combined, so that there is not a separate series of symbols, but one symbol expressing one idea, " CAT," a familiar animal whose tail you may pull if you are a small boy, or whose back you may stroke. The child thinks of the animal, perhaps of some particular animal. This symbol is presented so often that not only does it become familiar, but whenever it is seen it conjures up the idea for which the symbol stands. When the letters have to be recognised separately and deliberately combined, and then thought given to what the combined symbol stands for, the child is not really reading at all, but is only spelling.

Children may be taught to reach this stage in a fortnight; that is to say, in that time they lose the idea of the mere symbol and think of the thing about which they are reading. They may, however, with inadequate teaching, take seven or eight years before they reach that same stage, and may in fact never reach it at all. It is a common experience to find a child of even eleven or twelve who can read aloud at some speed, and yet when he is asked what he has been reading about, he does not know. That is not reading; that is saying words. Reading consists of tearing the meaning out of the passage as quickly as one can get it; some books must be read carefully from cover to cover; but there are many other books which are only worth skimming. Skimming a book means taking the cream off it, getting all out of it that one really wants. Whether one reads every word or merely skims, the time taken is usually far longer than it need be, for people have not been sufficiently taught to read *quickly* and to be intent on the meaning all the time.

These three stages, though they have been spoken of as successive, are successive only in their beginnings. The stage of learning new words and of learning to express oneself more clearly goes on for years. The child comes to school able to speak, but continually enlarges his vocabulary while at school and after. The same may be said of the learning of symbols. He learns to read more quickly and easily after he has been introduced to new ideas.

Now, in so far as reading print and reading maps are similar, the methods of learning these accomplishments should also be similar, and in fact this is so. The same three stages are recognisable in learning map-reading as in reading print. There is a stage in which children learn to recognise things around them; there is a stage when they are introduced to symbols for those things that they know; and there is a stage when they are introduced to new things by means of the symbols.

1. The first stage is begun early, long before there is any attempt to read print. Comenius says: "The elements of geography begin when children begin to distinguish between their cradles and their mother's bosom." What is learned at this stage is not taught

formally at all; it is picked up. Even before a child comes to school he usually knows how to come and how to go home, and he often has considerable acquaintance with the sweet-shop. In other words, he knows something of routes and markets, fundamentals in geography. In fact he has learned a great deal about his environment and the influence of environment on himself and his movements.

What has been said about the sequence of the three stages of reading is also true of the three stages of map-reading. The first stage does not finish immediately the child is introduced to maps. The area known from experience must be extended and the knowledge of it intensified in all possible ways in school and out of it all through the school course.

2. With the greater part of the first stage teachers have little to do. Their work begins with the second stage, the introduction of symbols for the things that are known, and it cannot be said that this work has been seriously thought out, or even thought of, by any but a few teachers. There has, indeed, been a lamentable confusion between the work of the second and that of the third stage, and in practice the work of the second stage is almost entirely dropped. This is extremely unsatisfactory. A map is at least as difficult to understand as the printed page, and is probably a great deal more difficult because it says so many things at once. What is done in giving a map to young children, who have not been taught laboriously to read it, is equivalent at the best to putting a fairy tale before those who do not know their letters, or who barely know their letters; while at the worst putting a political map of England in front of them is equivalent to asking them to discuss

a play of Shakespeare, a very fine piece of literature no doubt, but not to be read by beginners. Before any one of these things is possible the symbols must be not merely learned, but learned so well that they are scarcely noticed, while the ideas which they convey stand out prominently. The aim is to use a map as one uses a binocular, *i.e.* to look through it, not at it, and to be as little conscious of it as possible.

Plenty of time must be taken over the work; things must be learned by iteration, slowly. It is not sufficient merely to say, "The children ought by now to know what a map means, so I shall now give them a map of Europe." The children must, in fact, know what maps are and that they have a message before the third stage is begun. One does not say of a class learning to read, "They know their letters," or "They must know how to read now, so I will give them a play of Shakespeare." One makes sure that they know more than their letters, and that in fact they can read before one begins the third stage in teaching to read the printed page, and even then one does not begin with Shakespeare. The course starts with things thoroughly well known; it proceeds with things that are perhaps a little less well known. No definite time can be assigned for this: one does not take a week or fortnight or month, but just as long as is necessary. The essential thing that the children must learn is that the map deals with realities, and that like a book it tells *them* something. This must be learned, too, so that it is not thought of as learned, or, indeed, not thought of at all; it is assumed. Till this is assumed the map is as readable by pupils as are hieroglyphics.

Of course all this takes time and thought. It is a long slow process, and because it is a long slow process map-reading is practically unknown. Even in universities there is little more than map-spelling. To achieve the desired results the matter must be chosen as deliberately and the work graded as carefully as when we are teaching children to read words. Teaching map-reading is not done by drawing a map of the class-room or by a lesson with an Ordnance map. It is a process which lasts all through the school course, and in its later stages may last through the university course also.

3. When the children know that a map stands for real things they can begin to learn something fresh by means of the old symbols. The first ideas must of course be simple, not advanced, and again must we emphasise the fact that all the more may be done later, and done quickly, if care is taken not to hurry at the beginning. Here certainly we find that the more haste the less speed. Teachers have been usually so much in a hurry that they have not given time to the necessary preliminary spadework. The result is that little real progress is made.

All this implies that there must be a definite thought-out graded course on map-reading if maps are to be used at all. No geography course in which maps are used can be satisfactory if it eliminates map-reading altogether, or if it makes map-reading a haphazard business to fill up odd times. We shall in later chapters attempt to formulate some of the principles in the light of which a map-reading course may be organised, but for the present we shall conclude by making three statements—one negative and two positive.

The first, negative, is that just as one does not learn to read print by reading the same page day after day, and only that page, so one does not learn to read maps by looking at the same map of England day after day.

The second, positive, is that just as learning to read is helped enormously by learning to write, so learning to read maps is helped enormously by learning to make maps. Map-reading implies map-making in a graded course.

The third, positive, and much the most important, is that the map course should be closely bound up with teaching of geography. To give a concrete illustration, there should be no map periods independent of the geography work; map-work should not be left, for example, as in a primary school it is often left, till Friday afternoon when the children may be given some map-work to keep them occupied, while the teacher marks the register. The map-work should be an integral part of what the children learn in the geography lesson, and normally should be done in the geography lesson. A considered attempt should be made not only to work out a course of map-reading, but to work it out in connection with the geography course.

CHAPTER XI

THE FIRST YEAR'S COURSE

BEFORE going on to discuss further principles on which map-work is organised, we shall proceed in this chapter to outline a scheme for the first year of serious formal geography; this has stood the test of experience for a couple of decades in schools of different kinds. It will at once serve to clear the ground and provide practical examples of important principles.

We must first, however, be clear on one fundamental matter. Are we or are we not to use "picture-maps" in this first course? It is sometimes suggested that these provide stepping-stones to maps in ordinary use. It seems to the author that there is a twofold fallacy here.

1. A picture-map tells more than a map, and what it tells more is wrong.

2. It is extremely unsatisfactory, to say no worse, to learn what has eventually to be unlearned.

A picture-map differs from a picture and from a map in stating some facts that are wrong. Just because it looks more real than a map it is all the more insidious. It is believed to speak the truth even when it is definitely giving a wrong impression. A map may, if read badly, give an impression that things are smaller than they really are, but one cannot blame the map for that; the error is in the interpretation. A picture-map, on the other hand, definitely states that things are closer together than they really are. A map may give a wrong impression of vertical scale, but, again, the impression is obtained by a wrong interpretation. The map is not at fault, but the picture-map *is* at fault, for it almost invariably exaggerates vertical scale.

In the second place, the picture-map is a makeshift intended to be discarded sooner or later. Now, it is quite true that there are instruments, for example, crutches and perambulators, which are used for a time as makeshifts and then discarded when they have served their purpose; but the analogy of the picture-map is scarcely with these, but with hieroglyphics and picture-writing which are first learned and then discarded. This is a waste, because it involves *un*learning something. Using a crutch or being wheeled in a perambulator does not make walking more difficult; it only postpones the time when walking is done. Using picture-maps as an introduction to map-reading does make it more difficult to use ordinary maps.

The conclusions from both lines of argument are that picture-maps are not stepping-stones to ordinary maps, and that the symbols which are to be used eventually should be used from the beginning.

Perhaps the most natural subject with which to begin would be the actual home of each child, but there are practical difficulties in dealing with the homes in class-teaching. It is convenient to have the same area for all, and it is desirable that the area should be not only known well but seen during the lesson. This almost necessitates that we begin with the class-room.

We begin then with a map[1] of the class-room for some purpose. It is important that each map drawn by the pupils all through their school course should be drawn for some purpose; it must therefore have a title which expresses the purpose; it will generally begin, "A map to show . . . ." If one cannot put a title expressing purpose under any map that is drawn it is not worth drawing; the map must show something, not merely the class-room or Ireland or South America, but something about these areas. As very little can be shown on any one map, one must particularise and say what particular facts are to be shown. This map of the class-room, then, must not be merely a map of the class-room, but a map to show something about the class-room. This first map may conveniently be "A map of the class-room to show where I sit."

Having a purpose in drawing our maps we have a test by which we can say whether as a matter of fact the map drawn is a good map or a bad one. The test is not whether it looks pretty and is neat and tidy; the test is whether it fulfils the purpose for which it is made. The test in this case is whether one can take a particular map that one of the members of the class has drawn, and without any other help go to his seat. If one can do this the map is a good one, if one cannot the map is a bad one. It does not matter how pretty it is; the test is "Can it be read and can it be used?" One does not condemn neat maps, very far from it, for neat maps on the whole are easier to read than untidy ones. But neatness by itself does not make a map valuable. There are neat, tidy and correct maps;

[1] Note that this is not called a plan but a map.

these are the best. Then there are the untidy, blotty correct maps that can be used ; these are the next best. Then there are the untidy blotty maps which are wrong. At the bottom of the list are the tidy neat maps that are wrong. The last are worse than the untidy incorrect ones, because more time has been wasted on what was not worth doing. It is only worth while being correct.

The thing that matters is whether the map is usable or not, whether within the limitations of the class conditions it shows what it is intended to show. The test in this case is not whether all the desks are shown crowded into one corner, whereas they ought to fill over half the floor space, or whether the central lights which in fact hang from the ceiling are shown in some mysterious manner hanging from a wall. These are mistakes, no doubt, but they are of the second order of importance and will right themselves without any attention from the teacher, and, indeed, all the better if the teacher does not attempt to interfere. The fundamental thing, we say again, is "Can the map be used to go to the particular seat and unhesitatingly identify it ?" If so it is a good map notwithstanding the mistakes.

Having agreed that the map is a good one we can still concede that the mistakes ought not to be there, and that the map would be better if the mistakes were not there. The natural thing is to do it again in the same way. It certainly will be well to do it again, but equally certainly it will be well, if possible, not to do it in the same way. That merely kills enthusiasm, and if we are to get any real result we must make the children enthusiastic. Nor do we wish to point out the mistakes; insist on the facts and the mistakes will take care of themselves.

The obvious teaching device is to make the lesson look different. Give it a different title. Make the "patter" different, as the stage phrase is. One can indeed begin the lesson by saying that we are now going to do something quite fresh. It is really safe to say this only when one is going to revise; if one says it and does it the pupils are often apt to be confused. You will say to them, "I wish you to make a map this time not to show 'where I sit,' but 'how I go to my seat.'" In effect almost the same map will be drawn.

It is to be noticed that both the exercises suggested are very much more than mere map-drawing. They deal with fundamental geographical ideas, and however like they may seem are really very different, and in the second we do not perjure ourselves when we say we do something quite fresh. In the first the emphasis is on position, site, settlement; in the second the emphasis is on movement and the natural route. These two ideas are very distinct, so that it is not just a teaching device to say that the second lesson is a fresh one. The geography of the second is very different from that of the first.

Notice also that the children are introduced in the second exercise to the idea that the natural route is not necessarily the shortest line on the map. It is true that many boys, if not girls, with the real sporting spirit of climbers and explorers of difficult places, are attracted by the very difficulty of the straight route over the tops of the desks, but this is not the normal and natural routes to their seats by the gangways;

these routes will be shown on the map by dotted lines.

One further caution must be given. There should be no attempt in those two exercises or those that follow to draw the maps accurately to scale. If we may assume that the length of the class-room is 20 feet or over, and that the paper used for the map is 5 or 6 inches in length, it is obvious that the only possible scale is one in which something like a quarter of an inch represents a foot. In the case of children who are able to do the work which we have outlined at the most suitable age for doing it, about eight or nine, the attempt to deal with quarter inches will in the great majority of cases turn the lesson into an arithmetic lesson, which may be very good of its kind, but which is certainly not a geography lesson. The proper place for the construction of a plan to such a scale is probably in the year following that in which the course now outlined is done. In this first geographical course we are dealing with scale in another way. We deal with it qualitatively, not quantitatively, in order to give ideas of scale. It will be quite sufficient at this stage to notice which is the longest side of the room, and represent the proportions of the room roughly by eye without using the word "scale" at all.

Before work can be done in any way quantitatively accurate the idea of scale must be familiar. The idea is suggested in the first two lessons though nothing is said of it, while in the third and succeeding lessons the idea becomes more and more familiar, and eventually the word may be used. Perhaps it is not out of place to say that the use of the word does not imply that any definition may be given. The place for definitions is at the end of a course, not the beginning.

In the third lesson, then, the area mapped is increased, while the paper used is the same size as before. Things outside the class-room door should now be represented. In this exercise not only is the idea of scale more prominent, but a beginning is made with what is of fundamental importance in understanding geography. The young people must think through a stone or brick wall, or at least through a wooden partition. When one can think through a stone wall one is beginning to acquire the ability to imagine the rest of the world. Here our pupils make the one big jump not only in mapping but in learning geography; for the great difficulty is to get people to imagine what is on the other side, where are things which they do not see, whether the other side is the other side of a partition, or the other side of the town, or the other side of the country, or the other side of the world.

First they deal with things which they both see and know, where they can easily verify a fact if they do not remember it. Though the facts in this exercise are known they have to be thought of. That is the essence of geography. Practically all geography consists of thinking through stone walls, and much of it consists of making mental pictures of what has never been seen and never will be seen. That obviously is difficult, and it is well to give practice in the easier task of thinking of things which have been seen, but are not seen at the moment. It may be a help to leave the class-room door open, as experiment suggests that it is easier to think through an open door than through a closed one.

Following on the first two lessons, then, in which the things mapped are seen, those things are mapped which have been seen, but are not seen at the time they are mapped; in these lessons for some purpose or another the class-room together with the surrounding rooms are mapped. Good reasons may always be found for drawing maps "to show" something or another on smaller and smaller scales. Then follow the whole school, the school and playground, the school and streets near to the school, then the school and streets farther away. We can have maps to show "How I go home," "Where we get bread from," "Where the butcher's shop is."

If about this stage the children make their maps to show where they live, the facts may all be plotted, with a red dot for each pupil's home, on a big map made by the teacher. Each boy or girl is intensely interested in his own red dot and the importance of corporate work is suggested.

Then the area mapped may be gradually extended. In a school in central London, to take a particular area, maps may be drawn to show "How we go to St Paul's," "How we go to the river," "How we go to Westminster Abbey," or "How we go to the British Museum." Such maps should have definite reasons for their construction, and these reasons will of course be different in different schools.

By proceeding slowly in this way the pupils learn to understand scale more and more clearly. By extending the area and using pieces of paper of the same size, the meaning of scale is continually being forced on them, and not only so, but the sizes of the things which they map are being drilled in.

Nor is this by any means all. In the process of mapping area after area which they know, the children are learning map-reading; they are learning what is seldom really learned, that maps stand for real things, and they are learning to associate symbols with the things for which they stand. That they are learning is evident. If at the end of five or six weeks the children are asked once again to draw a map of the class-room, it will be done very much better than on the first occasion, though there has been no further drill in the exercise. The gas or electric lights which really hang from the ceiling will not be shown apparently hanging from a wall as may well be the case at the first attempt. There will be more sense of proportion, and generally the impression will be given of a greater understanding of what is being done. The children will have taught themselves.

Sooner or later, and usually before unknown districts are reached, we require to map areas that are higher or lower than others. This has been done on the old caterpillar method. "Caterpillars" are really a degenerate form of picture-mapping. On old maps "ranges" of hills were shown by little pictures of hills one behind the other (fig. 4). Later, these "ranges" became caterpillars. Ranges of mountains have also been shown by means of thick lines. Both caterpillars and thick lines are now rightly condemned, because highlands are not lines and are not normally what the caterpillars attempt to suggest, ridges. Highlands are areas and should be mapped as areas.

But there is an even better reason for this procedure. A line is a much more advanced idea to a child than an area, so that area work comes naturally before line

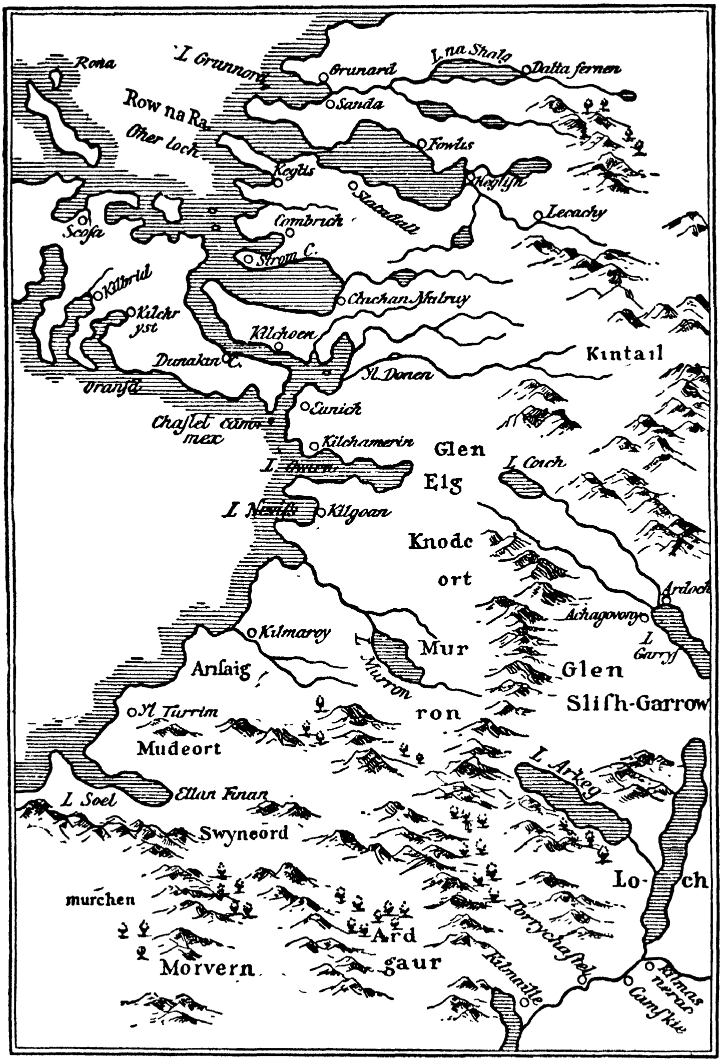

FIG. 4.—Part of Robert Gordon's map of Scotland, 1653, showing "ranges" of hills.

work. Of course this is directly opposed to implications in the work of our lately deceased friend, Mr Euclid. He begins with points and goes on successively to lines and areas; one is supposed to be doing very advanced mathematics indeed when one works with three dimensions and studies solids. But the infant knows better. Within five minutes of its birth a child's hands can close on something solid, and it can hold on for some seconds supporting its own weight. The child is certainly conscious of solids very early in its life. Solids are what he is "up against" and falls down on; he does not think of areas, and indeed the idea of area is a somewhat abstruse one. The idea of three dimensions presents in practice a much more simple idea to the child than does that of two dimensions. Similarly, two dimensions is in fact a much more simple idea than one dimension. Something which is a length without any thickness is not an extraordinarily easy idea to grasp, and a number of misapprehensions which are common even among children in more advanced classes, and which vitiate a good deal of teaching, may be traced to a lack of understanding on the part of their teachers of the need for careful preparation for such difficulties as this.

By the time the children are eight they can deal comparatively easily with areas though not with lines. One can then show the higher lands and lower lands, when one comes to them, as areas. But here there is a difficulty. Our possible instruments are pencils, pens, paint-brushes or chalk. As we do not use paint-brushes for ordinary writing, the children are not really familiar with their use as are Chinese or Japanese; if we were Chinese or Japanese we should certainly use paint-brushes for area work, but being situated as we are it is probable that the normal instruments will be the pencil for children and the piece of chalk for the teacher. Coloured crayons are possible for young children, but crayons are rather messy, and older children tend to look on them as babyish. For more advanced work coloured pencils are a convenience. Neither pencils nor pens of course draw lines in the strict mathematical and geographical sense, but they make what we may describe as linear marks, and it is these linear marks which have to be used to obtain the effect of areas.

Areas are sometimes shown by dots. These are quite in place for some purposes; in advanced statistical work they are invaluable, and as a means of covering areas by mechanical process they have their use, but they are out of place at this stage. Of course children, boys especially, like to make dots, for the reason that the marking causes a great deal of noise; this is not, however, a good enough pedagogic reason, especially as dotting is about the slowest possible method of representing an area. Using dots wastes time; this effectually condemns the method in school. An area can be covered by "linear marks" or lines in a hundredth part of the time it would take to cover the area by dots.

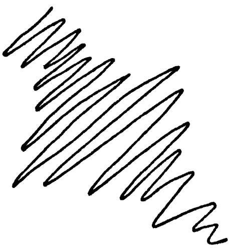

FIG. 5.

But in drawing lines there are unsatisfactory methods as well as satisfactory methods. Such an unsatisfactory method as that shown in fig. 5 should not be allowed. The objection is not that it is untidy, but that it is wrong and does not represent facts. Nor does such a method save time. The area to be shown as "high," for example, may just as easily and much more accurately be marked as follows. Delimit the area by an outline which roughly corresponds to a contour line, though one should certainly not mention this fact. The contour line will fit into its place later when the time comes for "precising" things. For the present we desire merely to suggest ideas, as we did with scale, and not to teach anything which must be unlearned. Within the outline, pencil lines (we shall use the ordinary nomenclature) may be drawn quickly freehand from top right to bottom left or from bottom left to top right. They are drawn quickly because in fact they are more neatly drawn thus, and because other things being equal all work should be done as quickly as possible. They are drawn freehand partly because ruling the lines takes time, but also because the final effect at this stage and probably at all stages is much better than when a ruler is used. The direction of the lines may seem a minor matter; this is so, but it is slightly easier than any other when the right hand is used. All symbols should be explained. In the corner of the map where explanations are given of symbols used, a little oblong is drawn filled with lines in the same way and labelled "high ground." Now and for a long time after there need be no mention of actual heights. The mention of heights will come with contour work.

Now it should be noted that a portion of a map shaded in this way does not necessarily stand for a mountain, hill, or even highland; it merely represents that portion of the land known to the children which is higher than another portion. It may perhaps be objected that the children will associate wrong ideas with such shading, that they may think of other areas which represent mountains and hills and which are shaded in the same way as being as flat as the lands they know in their immediate neighbourhood, which are most likely to be very flat. But apart from the fact that whatever the results may be, it is only in terms of what they have seen that they can interpret what they have not seen, it may be pointed out that if children obtain an idea of the relief of the earth from mapping such areas, it is probably nearer the reality than are the ideas of mountains and hills which are fairly prevalent even now. The fact is that the earth is extraordinarily flat, and most school playgrounds, however flat they look, are good models to scale of the greater portion of the earth. If the relief of the Alps and Himalayas is somewhat stronger than the relief of the playground, Siberia, the plain of the Amazon, and even the plains west of the Mississippi are much flatter than any playground ever is.

Sooner or later, in extending the area mapped, one will come to areas which some of the class do not quite know or do not know at all. This marks another stage in the work. Up to this point the children have been learning what a map is in terms of the things they know. Now they are beginning to learn something new by means of the map. This is a big jump and must be realised as such by the teacher.

It cannot be too much insisted on, however, that there should be no suggestion that something very difficult is to be done. It should not be suggested even that the work is in any way different from what has been done before. Simply show this new area to the children in its relation to the things they know to be real, and it also will acquire a reality because it is shown in connection with these other things.

As a matter of fact the transition from the known to the unknown is not sudden. There is no sharp boundary. The well known shades off into the less well known and the partly known before the unknown is reached. Also what is unknown to one member of the class is known to another, and especially is this the case where children come by car or train from some distance. It may even happen that a boy may know fairly well the areas in which his school and his home lie, but be ignorant of the district between. The fact that what is unknown to one is known to another serves to aid the teaching.

We here notice the importance at this stage of always showing what has been learned in relation to what is being learned. In the first few maps the desk is shown and other facts are related to that. Later, the desk becomes too small to be shown, and the class-room takes its place as the geographical centre of the map. Later still, even the class-room becomes too small and the school takes the central position. It may be retained in all subsequent work if the children so desire, but as it shrinks in apparent size there may be a great sharpening of pencils to obtain a point fine enough to represent the school on a satisfactory scale. When this is done spontaneously one knows that scale is realised and is not merely a name.

Incidentally there are several advantages in this method of gradually enlarging the area mapped while still retaining all that has been done previously:

(*a*) as an area is mapped repeatedly it is continually being revised without losing freshness; (*b*) it is impressed on the children, without anything being said, that maps miss out many things; (*c*) the areas nearer home, and the more important at this stage for that reason, are mapped not only more often but also more thoroughly than are those farther from home.

Proceeding in this fashion, then, and at first exceedingly slowly, we shall at the end of six months or so have mapped an area within some five, ten, or twenty miles of home. The area covered will depend on whether the district is city or country. It is perhaps scarcely necessary to say that the region studied in this way should in some sense have a unity so that it is likely to be somewhat irregular in outline, and the school need not be in the geometric centre.

So far we have dealt only with the first half of the first year's work, and that only in so far as mapping is directly concerned. We desire to give some idea of what a map is, and to teach a new area in terms of an old so that it is suggested that that new area is just as much a reality as the old is a reality. But we also desire to make a beginning in suggesting that in geography we deal with the world as well as with our homeland; there should occasionally be lessons on people in other lands. It will be sufficient to give only a few, for it is possible to have too much of a good thing and a few go a long way. If the children hear of too many peoples they only get confused. A teacher once came to the author and said, "What am I to do now? I have given lessons to Form I on thirty-five different kinds of peoples in Africa, and I have come to the end of those I know," The only possible reply was, "I hope to goodness you have." This was neither good teaching nor good sense. It is not advisable to take more than three or four different peoples in a term as subjects of lessons. One should begin with the simpler types—Eskimo, negroes, and pygmies; later in the year lessons may be given on Greeks and Japanese, Swiss and Norwegians, in which cases human response to geographic control is more complicated. Really reliable pictures are extraordinarily useful at this stage, especially when exhibited by lantern or stereoscope.[1] Folk-tales also may be used with effect; in these tales the all-important detail supplies the background to the story. Perhaps it may be well to state explicitly here that maps should *not* be used in this part of the course. Such maps would mean nothing to the children. The place for maps in connection with such work is later.

In extending the known area outward from the home region in the second six months, it is good to work with a similar idea in mind. It is good to know something of the peoples of our own land. Such lessons *can* be directly related to the mapping course. In such lessons we can select a few typical peoples, again not too many, such as the wheat farmer of Norfolk, the fisherman of Yarmouth, the dairy farmer of Aylesbury, the orchard grower of Kent, the coal-miner of Northumberland, or the cotton operative of Lancashire. The lesson on each of these would consist in working out the story of how he lives. This is obviously somewhat difficult, not because the form of the lesson is difficult, but merely because few of the facts are known to most people. It is indeed extraordinarily

[1] For the method of teaching by the stereoscope, see p. 209.

difficult to find out what people do from six o'clock in the morning till ten o'clock at night, or from eight o'clock in the morning till twelve o'clock at night, and from 1st January to 31st December. Perhaps if we knew we should be more sympathetic. We should certainly know more geography.

Here note that it is not a matter of isolated facts. Just as there is the possibility of contrast between the negro and the Eskimo, between the Norwegian and the Swiss, so there is the possibility of contrast between the wheat farmer of Norfolk and the dairy farmer of Aylesbury. The daily regime, the yearly regime, of the one is very different from that of the other. The cattle farmer of Ireland, again, has a totally different regime from either. The wheat farmer of Norfolk has an extraordinarily busy life all the year round. The work is always changing; he has always something different to do. Something has to be done just *this* month or things go wrong. The life of the dairy farmer of Aylesbury is much simpler. He also is busy, but his work changes little throughout the year. He has the cows milked; he sees the milk put in the churns and taken to the station; the cattle have to be fed and the churns washed. All those things have to be done every day throughout the year. There are some changes due to changes in temperature and light; the cattle are in the fields part of the year and indoors at another part, and this entails differences in the work. Hay has to be got in, fences to be mended, the farmer has to attend markets where cattle are bought and sold, and numberless odd jobs have to be done, but on the whole the daily routine holds throughout the year.

The cattle farmer of Ireland, on the other hand, is busy enough at some periods of the year, and has little to do for the rest. The same is also true of many cattle farmers all over the world. The Irish cattle farmer is indeed a type just as the East Anglian wheat farmer is a type. At this stage each is considered as an individual, but the lessons are not in the long run isolated lessons; they take their places in building up the general scheme, for the regime of each depends to a large extent on geography. In a great deal of Mediterranean history, to take an example from other lands, one can see interesting side-lights thrown on the subject by noting the farming regime. Harvest was a peaceful time in old days. Communities of farmers did not go marauding when their own harvest was still to be gathered. Each saw his own reaped before he made raids on others. But when everyone had gathered his crops then the raids began.

Good as all this is, it is not all that may be done. Such lessons, as we have said, have a direct connection with the mapping course. Maps may be drawn to show how the bread comes from the Norfolk farmer "to me," how "I" get apples from Kent, how the milk is brought from, say, Aylesbury to "our" dairy, how cotton comes from Lancashire for "my" clothes. They help to supply reasons why maps may be drawn outside what we may call the larger school area with its ten or twenty miles radius from the school. The maps make the lessons more precise, the lessons make the maps much more vital, and together they bind the geography course together.

One point may be noticed in connection with these lessons on the peoples of England. The subjects of the lessons are "The wheat farmer of *Norfolk*," "The dairy farmer of *Aylesbury*," and "The coal-miner of *Northumberland*." The association with a definite place makes the lessons geographical. It is a grave mistake to give lessons on "the farmer," "the miner," or "the fisherman." Such lessons are bound to be indefinite and lacking just that accurate detail which children love and which is the basis of all good teaching. Further, by omitting the name which locates the subject of the lesson, the geographical factor is eliminated. Each must be located; it is a minor matter in itself, but is here of importance, that it is only as each is located that map-work becomes possible.

To speak of "the farmer" is specially unfortunate. We have already quoted Kipling's saying: "There are nine and sixty ways of constructing tribal lays. And every single one of them is right!" There are far more than nine and sixty ways of farming, and every single one of them is right. There are farmers all over the world, in all sorts of different conditions, from the farmers of the great cattle ranches of the western United States, or the pampas of South America, or the grass-lands of Australia down to those of China whose farms may be only a yard or two across. "The fisherman" is almost as unsatisfactory a title for a lesson, for there are many different kinds of fishermen. The miner of Northumberland, again, is as different from the miner of South Wales as the farmer of Norfolk is from the farmer of Ireland; the conditions of life are different.

Utilising these lessons then and others equally obvious, maps, which extend the area known, may be drawn in the second half of the year. There is no learning of set facts, but all that comes naturally into the lesson and which the children can understand will find a place. It is extraordinary how few important facts are in practice left out by this apparently haphazard method.

The rate at which the ground is covered will, of course, be much more rapid than in the first half of the year, and the attempt should be made to deal with Great Britain and Ireland, or at least with the former.

One result of this method of proceeding outward from the home district may be referred to. Starting from the home area and going north, south, east, or west, eventually we meet the sea as a limit. Except in the case of schools actually beside the sea, the limit is reached much nearer the end than the beginning of the course. Even in the case of such schools there is another limit which the sea sets when it is again reached after the country has been crossed. It is all to the good that a good deal of geography is done before we meet with this line. Though the outline map may be necessary in upper classes it is nevertheless an evil, and it is unsatisfactory to introduce the idea of this "line" before it is necessary. As a matter of fact it is not good geography, for the important fact is not that there is a line but that there is a broad expanse of sea to be crossed if one would move farther.

Having come to the sea all round we have "done" Britain; the children have learned something of their land and its peoples, and can draw a map of Britain. The elementary requirement in years past at this stage was to draw a map of the home area and a map of

Britain. The idea was good, but the result was inadequate, and the methods which had to be employed to gain the result were faulty. By *relating* the map of the class-room to that of Britain the immediate results are improved and the methods are in accordance with modern ideas both of geography and of teaching.

CHAPTER XII

RELIEF

In Chapters X and XI we have discussed the importance of maps and have outlined a scheme for the first year's work. In this chapter we shall discuss the order in which different forms of map-work are most satisfactorily taken.

The work which we have already outlined and that of which we still have to speak depends to a large extent on one supposition. It implies such a familiarity with the symbols used that the symbols themselves are scarcely noticed. This in turn implies that the symbols used in maps shall always mean the same things. If a new language had to be learned every time one read a new book, or every time one turned to a new page of a book, it would not be possible to obtain much proficiency in reading. Map language and symbols are becoming fixed, so that it is now possible to learn to read maps fairly easily and to plan courses of work with the object of obtaining facility in understanding maps.

It will not be possible to give examples of planned courses in map-work as we did in the last chapter, seeing that many of the details depend on the order in which regions are studied, but general geographical principles will be suggested which may help in the organisation of detailed courses, and it must be again insisted on that the map course must be an integral part of the regional course.

There are maps and maps. Some are much more easy to understand than others. Also some are more easily understood by children than others. In map-reading as in geography the psychological order, if it can be found, is better than the logical order. One pretty obvious principle to observe is that things which can be seen should be introduced earlier than those which cannot be seen. Streets and houses can be seen, high ground and low ground can be seen, trees may be seen, but heat and cold cannot be seen. Streets, houses, high ground and trees will be introduced earlier than climatic phenomena; even when temperature is introduced it is well to use the temperature result which is most evident and map first "where the ground is frozen" or "where the sea is frozen."

Another obvious principle is one to which we have already referred, the importance of mapping areas before lines. Areas of the room, the school, houses, streets, areas of land and water, areas of high ground and low will obviously come before work with lines. Some phenomena which look like lines but are not lines may be mapped quite early—roads, rivers and railways. These are very narrow areas, and if mapping is begun in the way suggested in the last chapter they are recognised as such. Contour lines, isotherms, isobars, isohyets, political boundaries and lines of latitude and longitude are in a totally different category. They are lines in the mathematical sense. It will be noticed that just because they are lines in the mathematical sense they cannot be seen. For both reasons the consideration of these must be deferred till later in the course and the preparatory work very carefully arranged. The idea of the line may be suggested in different ways and, indeed, should be suggested in as many ways as possible. All of these, however, reduce to the fact that the line separates different areas. As work proceeds this may be made more and more precise.

We begin then with areas. These areas may be shown not only in the way suggested on p. 133, but by the use of any accredited symbols; for example, the symbols for trees (fig. 6) may be marked over woodland or forest areas. It should, however, be noted that all those forms of mapping which involve the repetition of symbols do as a matter of fact take longer than does work with pseudo "lines." Taking longer than need be is of course a deadly sin.

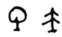

Fig. 6.

Maps at the earlier stages are necessarily rough, and even at later stages rough sketch maps must be frequently drawn. Occasionally careful maps may be undertaken; for these colour-work may be desirable, and in the upper school may occasionally be used. At the early school stage, however, children have not the necessary facility in colour-work to make maps quickly, and it must be recognised that a good deal of such careful mapping in colour as has been done in the past has been merely art work, legitimate as such and legitimate as an incentive to tempt pupils, especially girls, to a liking for geography, but not to be supposed for a moment to be real geography at all.

Of those things which are areas and can be seen probably the most important is relief. There are, of course, various accepted ways of showing relief in addition to the discredited caterpillars and lines. Relief may be mapped by hachures, by contour lines, by various more or less unsatisfactory systems of shading as well as by the layer system. These all have their places, but for the reasons already stated a simple form of the layer system is preferable at first to any system in which the emphasis is laid on lines.

Highlands are then shown as areas, the line bounding the area being the germ out of which the contour line may be developed, but it should be noticed that this boundary line need not mean a contour line at all. Fig. 7 may quite well represent ridges and valleys in which the point A in the upper part of a valley is higher than B on the lower part of a ridge. This convention may, in fact, be continued long after the lower school stage is passed; it is convenient and does not violate any principle.

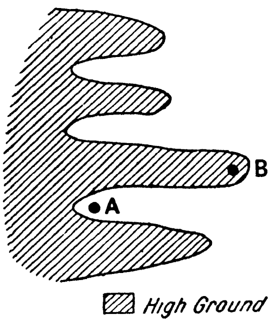

FIG. 7.—Diagram to show ridges and valleys.

By showing the high ground as an area much more precise knowledge of geography is insisted on than when, for example, a thickened broken "line" is accepted as standing for the Pennines in a map of England. It is quite easy to draw such a line with two breaks to represent the important "passes" of the Tyne gap and the Aire gap, but in order to do so little real knowledge and much real misunderstanding is required; to map the Pennines in this way is at once a confession of ignorance and, what is of more importance, a confession that somehow or another one thinks England is like that. What is the use of talking of the Pennines as broad moorlands and then mapping them as thickened lines! It is only another insidious suggestion that geography does not deal with realities. If the Pennines are to be shown as covering so much area then a knowledge of some real geography is necessary. The actual representation of the area takes little longer than it takes to draw a thickened line; it can be done sufficiently accurately for most purposes in twenty-five seconds; but of course the facts must be known. This emphasises one of the great advantages of maps, that they discourage slipshod work.

That the representation of highlands as areas is good geography is seen in another way. It is good geography and good mapping to start by drawing highlands before one inserts the coast-line. For many purposes the coast-line is not required at all, but when it is required it is easier to draw the coast-line last. If the area of the Pennines is inserted first, the east and west coast-lines of the north of England can easily be fitted into their places. Each has a definite relation to the central highland. The Solway is related to the Tyne gap, the Lune and Ribble estuaries to the Aire gap. If the coast-lines are drawn first there is no obvious connection between that on the east and that on the west. It is only by a barren effort of memory of facts which correspond to little that is geographical that each coast-line can be drawn correctly with reference to the other. It is only as each is related to the relief that it acquires significance.

The same is true of other regions. One can quickly draw a sketch map to show the geography of the New England and New York area if the highlands are first inserted and the coast-line put in afterwards. Europe, that bugbear of young map-drawers, loses its terrors if the relief is drawn first and the coast-line marked later, if necessary.

The tradition of the outline map is hard to kill; it is a remnant of the old capes and bays geography. It looks easy, but in the long run the pupil brought up on the other method will have learned more with less expenditure of energy.

Sooner or later in working with areas we are faced with another problem. We have shown ground that is high and ground that is low. In addition to ground which is high we now wish to show ground which is higher. This higher ground is to be distinguished from the ground that is high. There is a convention which applies to this and all similar cases. It is that the greater amount, whether it is of height, trees, people or heat, should be shown by the darker tone. This naturally implies another convention that one colour should be used on any one map to show one distribution; different colours should not be used. Indeed a further convention is in process of being accepted, that particular colours should be reserved for particular distributions; thus water distributions, whether of the sea or of rainfall, are mapped in various shades of blue.

The matter of colour scarcely affects us in school in making maps, except in so far as it is well to see that the conventions are adhered to when coloured maps, which require care and time, are made in the upper school. But, of course, map-reading has to be done, and it is well to utilise in class only maps and atlases which do not ignore the conventions.

Lest this may be thought to imply any objection to maps which show relief in two colours, let us hasten to say that this is not so. On the face of it we should have relief shown in only one colour and altitude might be shown in various shades of brown. Maps have been made on this plan, but they cannot be said to be popular. Most people prefer relief maps with brown and green. As a matter of fact there is probably a good reason for this. Relief is not a simple idea. We are concerned with two and sometimes with three distinct ideas which are based on the adjectives high, low and deep. On the sea we are concerned with depth, and the different depths are quite satisfactorily represented by different shades of blue. On the land we are concerned with two ideas. We think of some rather indefinite level, which indeed varies with the land thought of, as neither high nor low; above that level we think of the land as high, below it as low. It is therefore not only legitimate but advisable, to use two colours which will shade off into one another at the "indefinite" level.[1] It is for

[1] Perhaps it might be well to note that for height, though not for other things, it might be possible to use the chromatic (or rainbow) scale. Violet and the blues would be used for the sea and green for the lower land, and successively greater heights would be represented by successive colours of the scale, the highest ground being represented by red. Owing to the smaller refrangibility of red rays the red ought to appear nearer the eye and the effect of relief produced. In practice the scale is not used: most people are not conscious of the relief effect. For many years the author was not conscious of any difference in the colours, but with increasing age red appears distinctly to stand up from a blue background about a thirty-second of an inch, and other colours to a less extent.

a similar reason that in temperature maps it is quite legitimate to use two colours (usually blue for cold and red for heat) with gradations in tone for variations in each.

As we have said, colour is of importance mainly from a map-reading rather than from a map-making point of view. It should be noticed, however, that the underlying principle holds in a matter which does apply to school work. Maps of distributions should be drawn either in pencil or in ink, not partly in one and partly in the other. Normally pencil will be used.

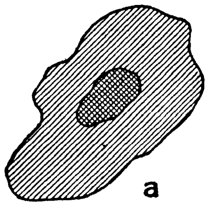

FIG. 8.—Diagram to show a good way of cross-hatching

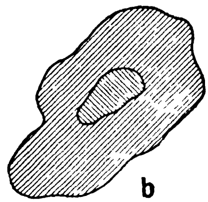

FIG 8.—Diagram to show a bad way of cross-hatching

For the mapping of high ground and higher ground pencil hatchings of different kinds will be employed, of such a kind that the higher ground is shown by the darker hatching. For high ground the hatchings will be drawn freehand from top right to bottom left, as we have already suggested: for higher ground, parts of the high ground will be cross-hatched as in fig. 8, *a*. Note that this is both easier to execute and more in accordance with convention than is fig. 8, *b*, which is in consequence unsatisfying and should be avoided.

When a greater number of gradations is required in later work it will be sufficient to add further horizontal or vertical hatchings, or both, to a portion of that already cross-hatched. As we may also leave areas unshaded and also pencil others entirely, six separate grades may be distinguished. This supplies as many as are necessary for area-mapping in most work that will be done in school. It is usually unsatisfactory to have to blacken areas entirely, largely because of the time taken, but with this scheme only very small areas will require to be so treated.

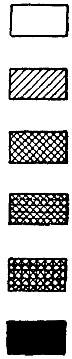

FIG. 9.—Scale of hatchings.

In Standard V or the Lower IV Form line work may be introduced. It may of course be done earlier, but if done earlier the time taken will be much longer and the work will not be so well understood. There is no time which is so badly wasted as that taken in teaching too early what can be easily learned later. This work can, on the other hand, be deferred till the children are older, but if previous work has been satisfactory, and of course this is the necessary condition for successful teaching of any kind, there is no need for further delay.

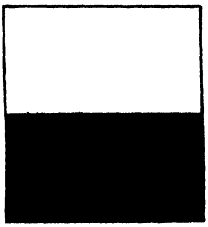

FIG. 10—A line is that which separates the black area from the white.

The idea of the line which we wish to emphasise is that it is that which separates two contiguous areas. The line that we can draw is not in fact a line at all. The only line which we think we see, and which we really cannot draw, is one which lies between two touching areas. In fig. 10 a line separates the black part from the white. This is the idea we wish to have in our minds when we teach lines.

Simple examples should come first. If the region studied is the British Isles the class might be furnished

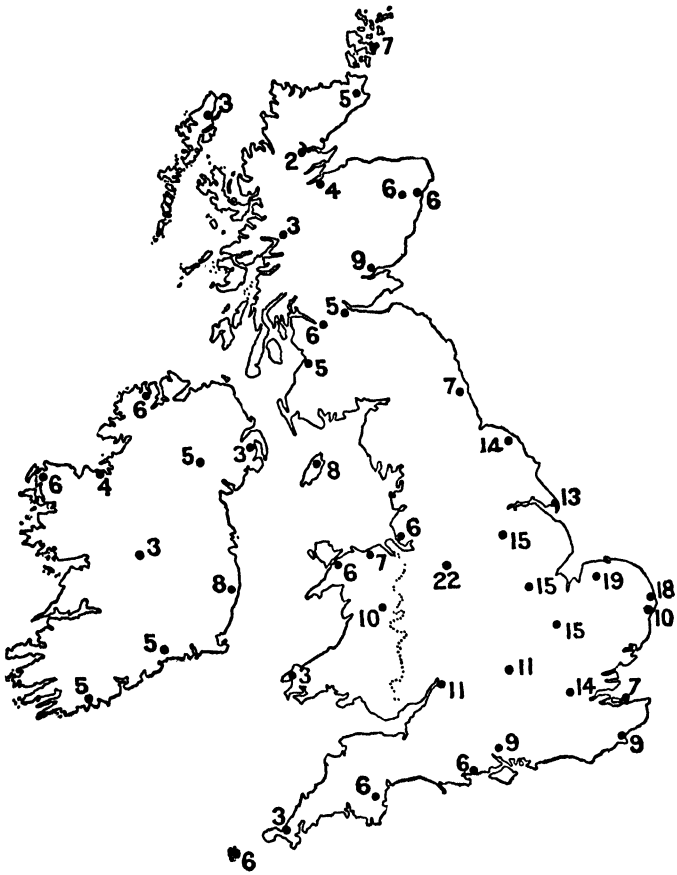

FIG. 11.—Map to show the average number of thunderstorms per annum in the years 1881 to 1905 inclusive.

with a map of the north of England, having as many rivers marked as possible. They might then be asked to mark the basin of the Yorkshire Ouse. It is, of course, obtained by drawing a line to separate all the rivers flowing to the Ouse from those which do not flow to the Ouse. The area would then be shaded.[1]

The work may also be done statistically. A map of the British Isles might be provided with the number of thunderstorms per annum marked on it. The pupils would then be asked to find where more than ten thunderstorms occur per annum on the average; a line will be drawn as a means of delimiting the area, and that area shaded. The mapping will be subservient to the geography; order will be seen where order was scarcely expected.

The line will be recognised as the boundary of two areas, that where there are more than ten thunderstorms per annum, and that where there are fewer than ten thunderstorms per annum. It will be noticed that one does *not* think of the line as one joining points where there are ten thunderstorms. This is most important. Neither in theory nor in practice is this correct. We have seen that in theory a line is that which lies between two contiguous areas; in practice, in all the operations which involve the drawing of lines, contour lines, isotherms, isobars or isohyets, the lines are drawn in order to separate areas. In fig. 12 the isotherm of 32° is drawn to lie between figures above and those below 32°. If we teach that lines are obtained by joining points we are teaching something that has to be unlearned later. If we teach lines as separating areas there is

[1] This exercise would not of course be left by itself; it should be linked up with the regional work by comparing the area of the Yorkshire Ouse with that of Yorkshire.

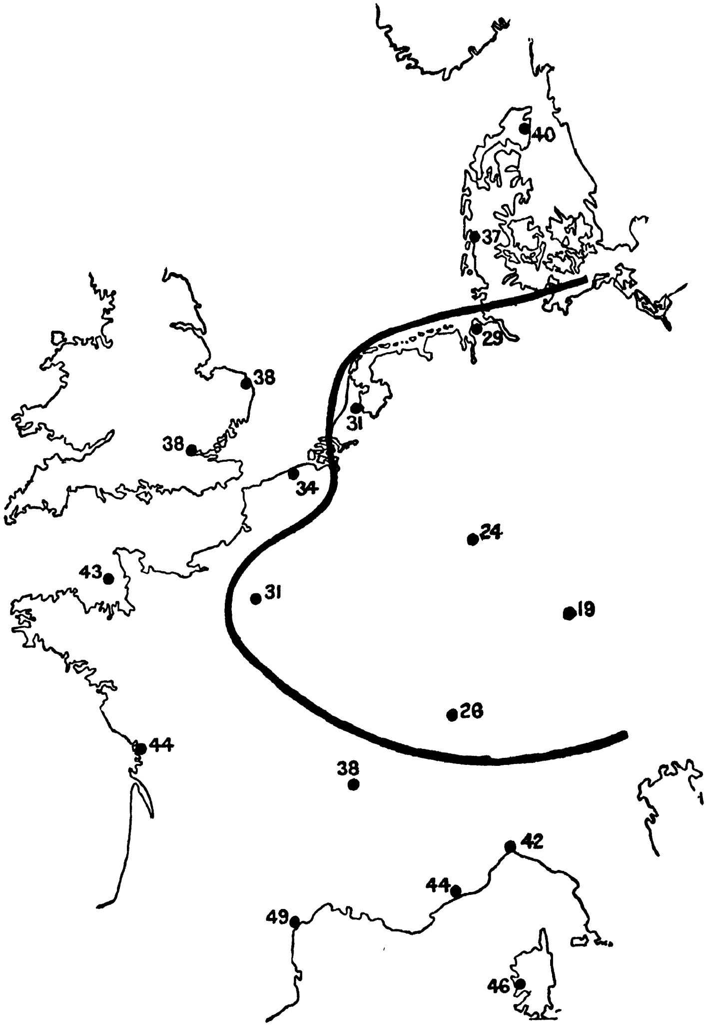

FIG. 12.—Temperatures over a portion of Western Europe. The wide line separates the areas under 32° F. from those over 32° F., and is therefore the isotherm of 32°.

nothing to unlearn. There can be no doubt which is the more desirable plan.

Having suggested line work to our pupils we can now proceed to "teach contour lines." There are several ways of doing this. Probably the best is that of which we shall speak in the chapter on "Home Geography." This method will, however, not always be practicable. In that case the next best is to start with a map of a lake. It has been found that many children have great difficulty in understanding contour lines. This is partly, no doubt, owing to the fact that line work in general has not been prepared for and presented satisfactorily, but there is probably another reason also. All the time that the teacher is speaking of contour lines as being so many feet above sea-level, the children are baffled by the often unconscious question, "But how do you know what the height is of a place a long way from the sea?" This prevents real attention being given to the matter in hand and further suggests unreality. It is the unconscious question which is difficult rather than the contour-line work. The method suggested above of starting with a lake obviates the difficulty of which any satisfactory method of teaching must take account.

The essence of this difficulty is that the pupil does not understand how one can measure vertically down through solid earth, nor how, if one could complete the measurement, one would know when sea-level was reached. Obviously one way in which this difficulty may be overcome is to start with the medium through which one can measure vertically, *i.e.* water. It is suggestive also that contour lines were first used in connection with under-water relief. It is often found that the historical development provides hints suggestive of the teaching order.

By using a lake we can eliminate the fundamental difficulty. Any Fifth Standard or Lower Fourth boy can at once tell how the depth of a lake may be found by dropping a string with a weight at the end till the weight touches the bottom. The matter need not appear difficult. All that is necessary is the presentation of the problem, a question and an answer. This will prevent the question which inhibits work from arising in the pupils' minds.

It is natural that the next step should follow on the last. We imagine lines of soundings from a boat across a small lake. The bathymetrical survey of Scottish lochs provides actual examples. Then we have our old problem, "Mark the area which is more than 10 feet deep," or 20 or 50 feet deep. This does not differ in essentials from what has been done before.

Now comes the crucial question to which the work for some years has been tending. Mark a point on the line bounding the area more than, say, 20 feet deep, and ask "What depth is this point?" The correct answer is not often forthcoming at once. Subsidiary questions must usually be put as to depths on either side of the line till the idea that the depth of the point is 20 feet is fairly plain. Another point is taken and the process gone through again. Other points are chosen till the fact is clear to everyone that all

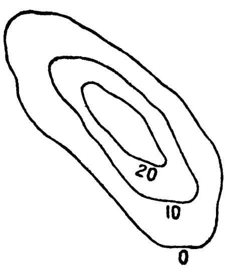

FIG. 13 —Map of a lake.

points on the line are of the same depth. There are plenty of points on the contour line, so that the argument may be gone through as often as necessary. The name of the line may then be given, "The contour line of 20 feet." The fact that the relationship of these points requires careful teaching emphasises the fundamental difficulty of grasping the idea of a line. Points on the shore line may then be chosen and the whole process gone through again. Points on other contour lines should also be taken, and the different "names" of the different lines obtained from the class, so that at the end of the lesson the class as a whole, though there may be exceptions, have obtained a fairly accurate idea of what is meant by a contour line.

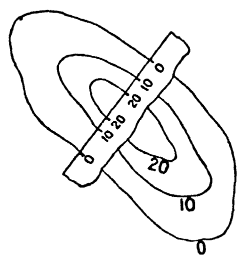

Fig. 14.—Marks to show depths are made on a straight edge of a piece of paper.

At this stage sections may be introduced. This is not altogether easy. The teacher has the choice of several methods. He may take the figures for one of the lines of soundings across the lake, whose form has just been expressed by means of contour lines. Such a line of soundings is in fact a section line. He can also use the contour lines which have been drawn for the lake and draw a section in the usual way. Whichever is done first, it is well to do the other later. It is sometimes convenient to imagine the lake frozen and the ice being mined from one end, so that the face of the section is left exposed. Fig. 13 represents a lake across which a section is to be drawn. From the beginning sections drawn from contour lines should be constructed in the recognised way by making marks on a straight edge to show depths and transferring them to a section line. Fig. 14 shows the marks made on paper, fig. 15 the marks transferred to

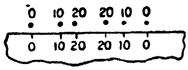

FIG. 15.—Marks are transferred to the section line.

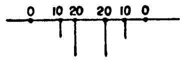

FIG 16.—The depths are represented by lines.

the section line, and fig. 16 the depths being marked. At first the lines marking the depths should be drawn as in fig. 16; they represent, in fact, the different positions of the sounding line. Later these lines may be omitted and merely the points on the lake floor marked. The lines are but crutches, and like all crutches should be discarded immediately they have served their purpose. When exactly that stage has been reached is a matter for the teacher.

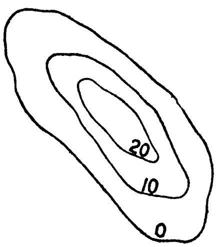

FIG. 17.—Map of a hill.

When contour lines and sections have lost their terrors one can easily take the map of the lake and alter the position of the figures, as in fig. 17, so that it represents a hill. The question is propounded, "How do you draw a section now?" The answer is of course easy. All that is necessary is that the construction lines of the section should be drawn up instead of down. The unconscious question which hinders work with contour lines on land will not now be prominent. Indeed, if the lake is supposed to be frozen solid a boy may himself suggest that the lake represents a hill upside down.

We have treated of this part of the work in considerable detail, both because it is crucial and because many teachers find a difficulty just at this point. We cannot give an account of further work in the same detail and can, indeed, say little more than that graded exercises must be introduced as the course proceeds. In arranging such a course we must keep in mind a fallacy which has caused much trouble in contour work in schools. It is that the map with a few contour lines is simpler than that with many. At first sight this appears to be so, but the fallacy arises from the fact that it is the map, and the map only, that is thought of, and the realities behind the map are forgotten. When we remember that it is these realities of which we wish to have some idea, it is obvious that fig. 18 is much more illuminating than fig. 19. In fact the attempt to understand the lie of any piece of country, shown by only a few contour lines, is about as sensible as an attempt to obtain the sense of a passage in a book in which all words but one or two have been omitted. It is, of course, easier to spell the words when there are only one or two, but if the aim is to obtain the sense of the printed text it is as well not to have too many omissions. Contour lines correspond to individual words. Each taken by itself means little or nothing. They require to be combined before they make statements. The more there are within reason, the simpler is the map and the more easily may it be read.

The shape of the country may be realised when many contour lines are given, and this is impossible when there only are a few. That this is so is obvious from the maps figs. 18 and 19. In fig. 18 the contour lines are seen in combination; in fig. 19 they are separate entities. It is then worth while noting details of shape. For example, compare fig. 18 with fig. 20 showing a railway cutting approaching a tunnel. In

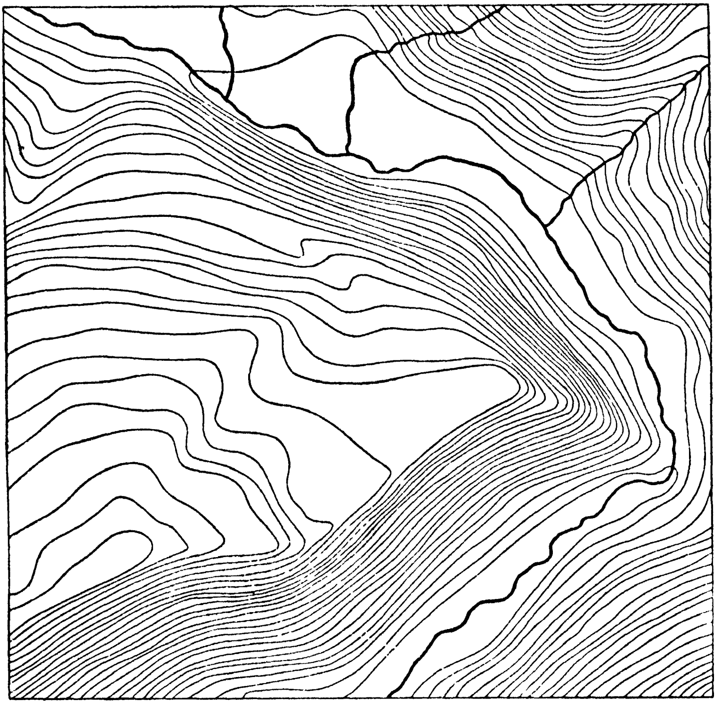

FIG. 18.—Map to show a valley worn into a hill-mass The vertical interval between the contour lines is 100 feet. The horizontal scale is an inch to a mile.

each of these cases the main form has a steep side where, in one case by natural forces and in the other by man's agency, portions have been removed. The edge of the portion which is removed is shown not by any definite drawn line, but by the successive positions of the vertex where lines sharply change direction. Very often it is these sharp changes of direction which are the vital facts, and the shapes that matter are given by the curves joining points where the sharp change

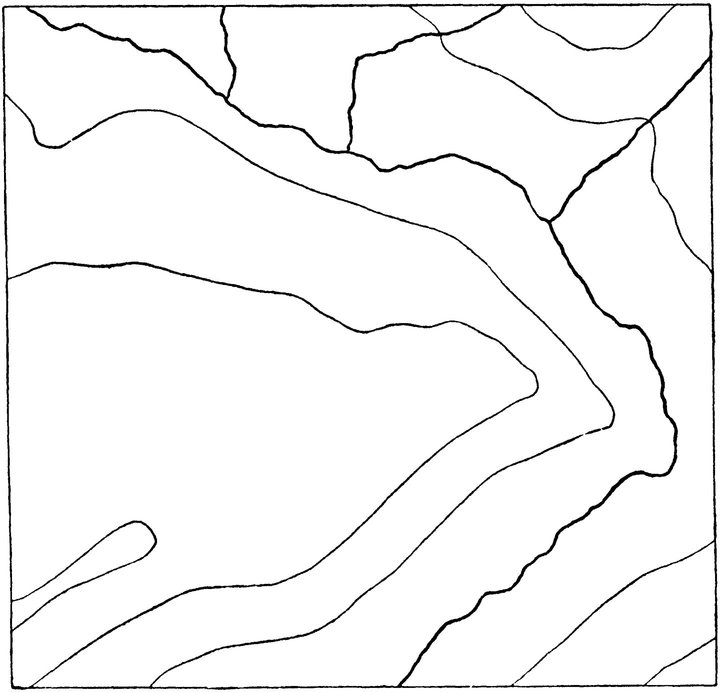

FIG. 19.—The area is that shown in fig. 18. In this fig. the vertical interval between the contour lines is 1000 feet. The map looks simpler, but it is really more difficult to read.

takes place. Maps of land-forms must always be read with this fact kept well in mind.

Sooner or later also, and sooner rather than later, sections to true scale must be drawn. It is usually difficult to draw these directly in the way suggested above. They are most easily constructed by reducing in a fixed ratio a section which has been constructed with an exaggeration of twice to five times the actual scale. There is always a danger in too great exaggeration, though sometimes this cannot easily be avoided. We have here an example of the way in which wrong facts are taught without anything being said. If sections are always drawn with considerable exaggeration, the inevitable result follows that the children accept the exaggeration as truth. The drawing to

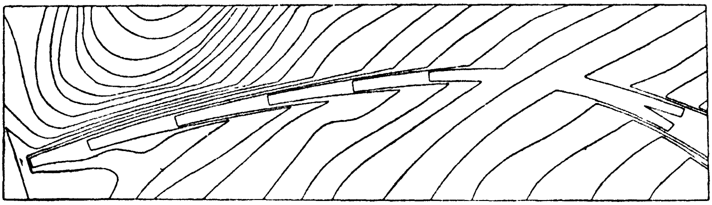

FIG. 20.—Map to show a railway cutting approaching a tunnel The vertical interval between the contour lines is 5 feet The horizontal scale is about 5 inches to a mile.

true scale helps to correct this misapprehension and emphasises what is the truth, that the world is extraordinarily flat. Later this may again be emphasised by drawing a section across Europe, the North Atlantic, and North America, not only to true scale but taking account of the rotundity of the earth. With 3 feet representing the earth's radius, a depth of a mile on the ocean or a height of a mile on land is represented by only $\frac{1}{100}$ of an inch or the thickness of a very thin line. Even if the radius is increased to 30 feet and drawn on a large floor space, a mile is represented by only a $\frac{1}{10}$ of an inch or the thickness of a thin chalk mark (see Chapter III, p. 26).

It is useful in the later work to draw sections which do not follow a straight line; by drawing a section to follow a river or a road the river or road profile is obtained. This work serves to correct ideas when pupils have learned to draw sections fairly accurately, and it may be thought that there is nothing more to learn.

Sections may also be drawn across maps of an area of low relief where few contour lines are shown. As we have suggested above this is by no means easy, and such work can be done only with an upper form. By taking advantage of spot heights given in the neighbourhood of the line of section, the position of streams, settlements, woodlands, the routes of roads and other features, natural and man-made, very accurate sections may be drawn and the work definitely related to the fundamental geography.

With a knowledge of what contour lines represent, ordinary atlas maps acquire significance. Up to the time when contour lines are definitely introduced, one emphasises the area of high ground only. Thereafter we can speak of the "area over 600 feet," or the "area over 1000 feet." Contour lines can, in fact, be used naturally, and by using them they are the more easily understood.

A fine exercise which gives a good deal of scope for imagination, while insisting on accuracy with very simple material, consists in constructing the view from some given point by means of a map showing contour lines. This may have various grades of difficulty, but even the simplest cases have their value. Consider fig. 21. On the face of it most of those who even glance at it would say that they could read such a map easily. Now let us see. Let us not merely imagine but find out what this island looks like and test our imagination against the result. We can construct the view seen through a window from a point in the room. We see a hill; we can make a representation of the hill on the window by drawing a line which just covers the outline of the hill when seen from the particular point of view chosen. Other objects and pictures can be represented in the same way. If the scene were extensive and subtended a right angle

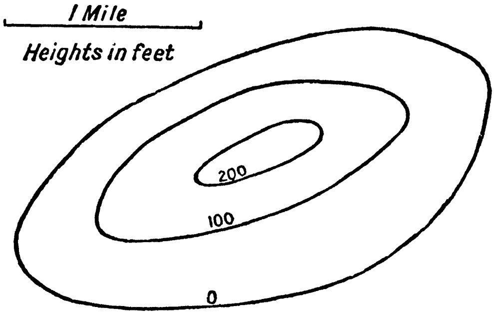

FIG. 21.

at the view-point, it would obviously be more satisfactory to have a section of a circular window whose centre is the view-point. Instead of having a circular window we could obtain the same effect by calculation and construction. We could determine the direction in which we have to look, and the amount which we have to look up in order to see a particular point. This is the method we adopt. The description may sound difficult, but in practice the work is easy.

In fig. 22 we select our view-point O, and from that we draw lines across the island through what we imagine are convenient points on the sky-line as seen from O. Two of those lines OA and OE just touch the ends of the island. Sections are then drawn along those five lines, as in fig. 23. Here $\frac{1}{10}$ inch is taken to stand for 100 feet. The amount we have to look up to see the sky-line in the section numbered 2 can be

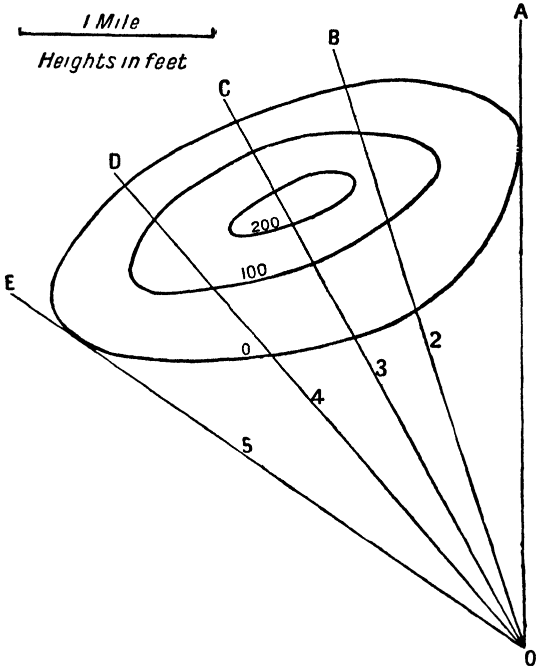

FIG. 22.

compared with the amount we have to look up to see the sky-line in that numbered 3 by comparing the perpendiculars BB′ CC′ drawn at a constant distance from O, fig. 23. The distances between these perpendiculars is found by measuring AB, BC, CD on sector of the circle ABCDE, fig. 22, and plotting these distances on the line AE, fig. 24. The sky-line will then be found by joining the points AB′C′D′E. This gives a representation of the island as seen from O, but it is not to true scale. On the map 1 inch represents 1 mile or

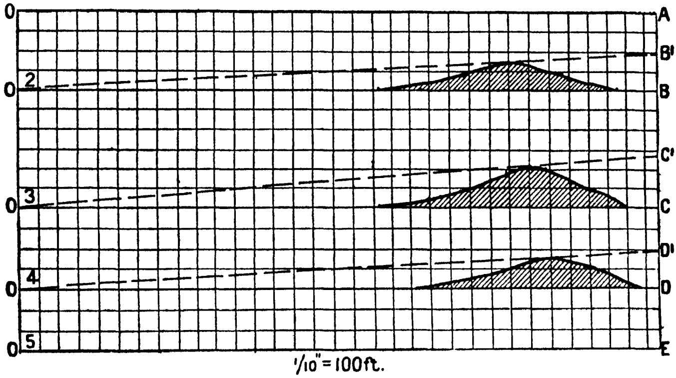

FIG. 23.—Sections along the lines in fig. 22. The horizontal scale is 1 inch to a mile; the vertical scale is $\frac{1}{10}$ inch to 100 feet.

5280 feet; on the sections $\frac{1}{10}$ of an inch represents 100 feet, or 1 inch represents 1000 feet. This gives approximately five times exaggeration as BB′, CC′, etc., each

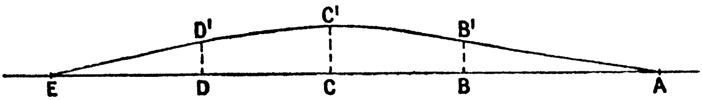

FIG. 24.

is 5·280 times longer than it ought to be. What the island really looks like is found by reducing each height to one-fifth as in fig. 25. Now it is left to the reader to decide

FIG. 25.—View of island from O in fig. 22.

whether the map, fig. 21, conveyed this impression. The fact was there, for we have utilised nothing which was not in that map, but it is doubtful whether the fact was read; further, it must be remembered that

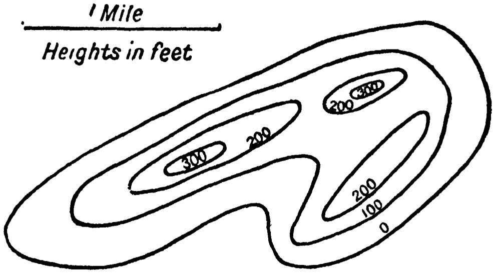

FIG. 26.

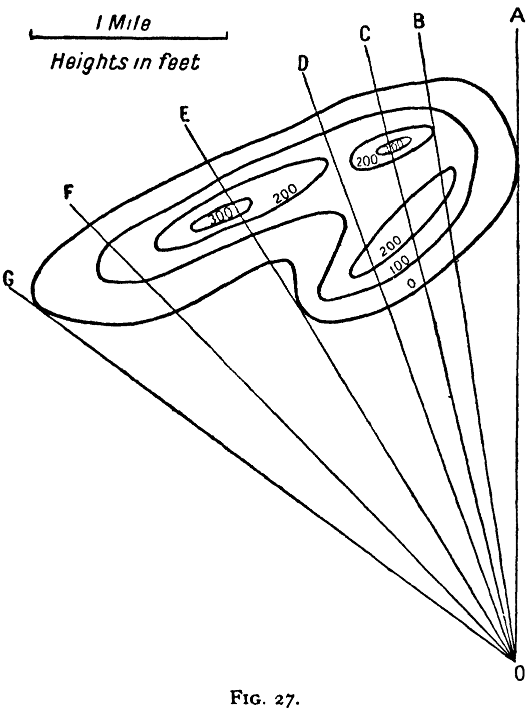

FIG. 27.

this is only one of the innumerable facts that even such a simple map as this represents, for similar views might be constructed from innumerable points round the island.

In the map drawn the sky-line is simple. Fig. 26 shows an island with two ridges. This is slightly more complex, but it cannot be called difficult. Views may be drawn in precisely the same way in order to check whether our imagination is accurate or

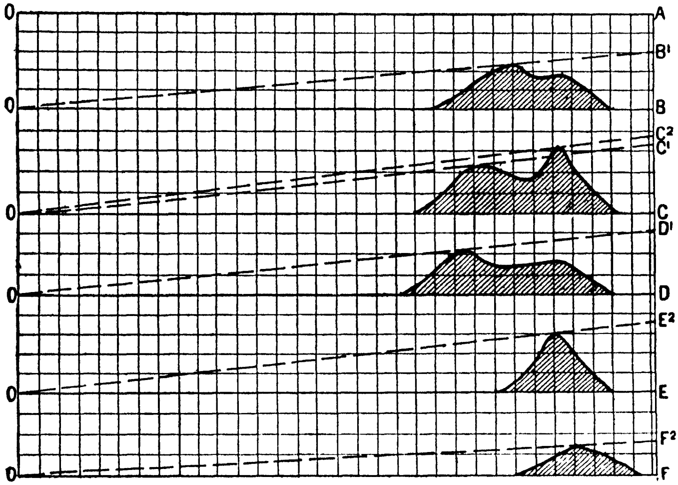

FIG. 28.—Sections along the lines in fig 27. The horizontal scale is 1 inch to a mile; the vertical scale is $\frac{1}{10}$ inch to 100 feet.

not. The view from O should show both ridges. In this case we may have two sets of perpendiculars in one section, as CC^1, CC^2, fig. 28, and we must note carefully to which ridge each belongs. The outline of each ridge is of course obtained by joining the tops of the perpendiculars concerned, and this requires just a little care and thought. In other respects the construction is the same. Fig. 27 shows the lines along which sections are drawn, and fig. 28 shows these sections. The view which does not allow for the

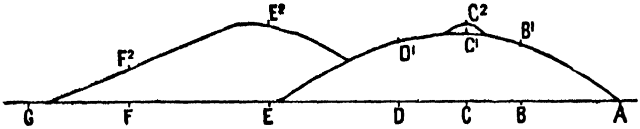

FIG. 29.

difference in horizontal and vertical scale is given in fig. 29, while the real view from O is shown in fig. 30.

FIG. 30.—View of island from O in fig. 27.

Again, this view and many others are expressed in fig. 26, but one wonders how many people can "read" it?

CHAPTER XIII

FURTHER MAP-WORK

Line work having been introduced largely in terms of contour lines, other forms of line work also may gradually be used more and more—isotherms, isohyets, and all the other isopleths, even isobars, if these are considered desirable. The construction of a map with such lines is essentially the same as the construction of a contour map ; if one can be done the others can be done also. An isotherm is drawn to separate areas having temperatures above and below the value represented by the isotherm, just as contour lines are drawn to separate areas above and below the height represented by the contour line.

But while methods of construction are similar the geographical values of the maps are different, and other problems which are introduced are of importance. The data from which climatic maps are constructed vary enormously, and the relative values of such maps vary with the accuracy and number of the data. Maps, like books, may be read critically, and we must consider to what extent reliance may be placed on the maps. The reliability depends on the accuracy of the observations and on the closeness of the net of the stations. In the case of averages the reliability depends also on the length of time during which the observations have been taken. A rainfall map of Britain compiled from the daily observations of five thousand observers is almost infinitely more accurate than a rainfall map of Central Asia, where over large areas no statistical observations have been made at all. Such things have to be taken into account in "reading" a map.

We may, however, look at this matter of map-reading from a different point of view, and note another sequence in which occur such climatic maps as involve the use of lines.

It might be noted that even at the very beginning of map-work, each pupil should attempt to make each map his own, by making it different from those of other pupils, and specially that he should make his map of the class-room different from that drawn on the blackboard, by inserting in it such things as tables, chairs, and other pieces of furniture which have not been represented on the blackboard map. This is advocated for the same reason as "copying" is rightly reprehended in arithmetic and dictation, that otherwise the map is not really made the child's own. Of course much of such work as is done at the beginning of the study of any subject is based on imitation, but it is unsatisfactory if it is all imitation. This principle applies all the way through work with maps, and condemns a vast amount of what passes as map-work, which is in fact nothing but slavish copying, even down to the printing of the names. Such work may have as much value as the old freehand drawing had, but it is of little value as geography. It is simply the method of the capes and bays in another form.

As mere copying must as far as possible be avoided, what must we put in its place? From this point of view there are three or four stages in work with maps. After the first in which imitation is the most important fact, new maps may be made from data which are *selected* from an atlas or another map. Then facts may be *combined* from different maps into one map. Then new maps may be constructed from *data supplied*, and, lastly, new maps may be made from *data found by the pupils*. In all these cases we must remember that whether expressed in the title or understood, each map should be a "map to show" something, and that there should be a key or explanation for each symbol used.

The selection may take many forms. A particular portion of an atlas map may be selected and reproduced to show some particular fact, only that portion which has to do with the fact being selected. A particular name, or names, may be selected for emphasis, where in the original there is no such emphasis. The area over or under a particular height may be selected for representation in order to bring out a special fact affecting settlement or movement in the area. In all these cases there is selection and not mere copying.

Then work may be done by combining two or more simple maps, or by combining facts selected from different maps. Temperature maps of Europe for summer and for winter may be supplied, and the pupils asked to mark on a new map the area which on the average is frozen during the whole of January, and also the area which has on the average a temperature of over 64° during the whole of July. By this means Europe is divided into four regions which have different characteristics. Similar exercises may be worked for other lands—Asia, the British

Isles, or North America. Or, again, the surface wind system of the Atlantic may be drawn on a map which shows the temperature of the sea. The coalfields of the north of England may be drawn, perhaps in ink, on a map which shows in pencil the land over 600 feet. On a simple relief map of London may be drawn the chief railways in order to bring out how the latter are related to the shape of the land. The distribution in Britain of sheep over 600 per 1000 acres and of cattle over 200 per 1000 acres may be drawn on the same map. An exercise based on this principle, which is always striking, is to supply two maps of the same area to the same scale, one showing the relief in contour lines, and the other the rivers. If the rivers be copied on tracing-paper and then laid on the relief map, boys and girls of twelve or thirteen will always be extremely interested to find, what obviously must be the case, that rivers follow the valleys.

The manner in which the data are supplied will depend on what is available, but wall-maps, atlases and maps drawn on the blackboard, or cyclostyled or jellygraphed, may all be used.

Then there are new maps to be constructed from data supplied. Such data are normally either climatic or economic, though an imaginative teacher may collect other material. Climatic maps are for the most part of the type of which we have already spoken (p. 170). The work usually consists in plotting figures, and then in some way emphasising the facts shown by the figures, and, finally, finding out the essential geography which lies behind those facts. The following may serve as an example of this work, and incidentally raises a number of points of method.

We have here the times of sunrise in hours and minutes (G.M.T.) on the first day of each month at four British stations.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Wick .	9.5	8.21	7.11	5.42	4.20	3.17	3.11	4.3	5.13	6.19	7.30	8.38
Yarmouth	8.6	7.38	6.43	5.30	4.24	3.38	3.35	4.13	5.5	5.56	6.50	7.42
Greenwich	8.8	7.41	6.49	5.38	4.34	3.51	3.48	4.24	5.14	6.2	6.55	7.45
Valencia .	8.51	8.25	7.31	6.19	5.13	4.29	4.26	5.3	5.54	6.43	7.37	8.28

We wish to use the figures in the table in order to get as much as possible out of them.

Obviously the first thing to be done is to have a dozen little maps of Britain made, one for each month. For such purposes as these are intended to serve, it is convenient to arrange them in two rows on a single sheet, with January to June from left to right in the top row, and July to December from right to left in the bottom row. In this way July comes just underneath June and January just above December. They are not unnaturally separated as they would be by placing July on the left and December on the right. Also, maps of months at corresponding times of spring and autumn are grouped together.

These little maps may be traced. In the author's young days tracing maps was a deadly sin, and copying maps freehand exactly like the original was the highest virtue. Now, when we insist on maps being drawn for a purpose, this matter of tracing maps takes on a different complexion. It is indeed a virtue rather than a vice. At the same time it is as well not to provide the materials for tracing maps, but rather to insist on the maps being done *quickly*. Some one will soon discover that tracing, where it is possible, is a method of doing things quickly and will introduce tracing-paper, home-made if none other is procurable. The idea spreads if it is not frowned on, and all the quicker if it is not definitely commanded. If the pupils keep their own tracing-paper, two advantages are gained; they are likely to preserve their material, and there is no waste of time in giving it out in class.

The maps being traced the figures given above must be plotted. The exercise provides opportunity for the pupils to become familiar enough with the process to learn to do the necessary work quickly. There are only four stations, all of which are probably known already, so that the emphasis is placed entirely on plotting the figures. Very often in schools pupils have just enough of plotting figures to frighten them without having enough simple examples to assure them that the work is easy.

Then comes the work with the figures as plotted. Probably the most satisfactory way to bring out important facts is to find the line on each map which separates the area where the sun has risen, from that where it has not risen when it is just rising at Wick. The simplest cases should be taken first. Let us take April. On the 1st of April the sun rises at Wick at 5.42. At this time it has already risen at Yarmouth (at 5.30), and at Greenwich it has risen some four minutes before, at 5.38. At Valencia the sun has not yet risen, as it does not rise till 6.19, or some thirty-seven minutes later. It is thus rising at a point about a tenth of the way from Greenwich to Valencia. If a line be drawn through Wick and also through this point it will separate as nearly as may be the area where the sun has risen from that where it has not risen. The same process may be gone through with each of the other maps, first with the easier cases of March, September and October, and then with the other months. Here again we have enough "examples," in the sense in which the word is used in an arithmetic text-book, for the children to "work" in order that they should become familiar with the process and find out how easy it is.

But the facts do not yet stand out on the maps as they ought to do. We can emphasise them by shading the area where the sun has not yet risen on each map. Theoretically, we have the choice of shading either area, but shading the western area suggests the darkness which obtains there. The title of the series of maps ("maps to show . . .") and the explanation of the symbol may be added.

We have now to notice the story which the maps tell. In the first place, the fact which surprises most people is noted that in summer and winter the "isosunrise" lines diverge very greatly from a north and south position. In the second place, there is to be noted the regular order in which the change takes place. In particular we notice that for some considerable time, from the end of April till the middle of August, the sun rises at Wick before it rises at Yarmouth, and we notice also that for some time in winter it rises at Valencia before it rises at Wick. By interpolating lines, say, on the 1st of July, we can work out over how much of the north of Ireland the sun has risen before it has risen at Yarmouth and at Greenwich. We can guess at what towns the sun rises at the same time, on that date, as it rises at Yarmouth or Greenwich. Similar problems may be worked out for the 1st of January, and generally the different conditions that exist within even such a small area as the British Isles may be emphasised; questions, for example, of the relative advantages of summer-time in the north of Scotland and the south of England in May, June, and July may be discussed; conclusions may be summarised in writing on the back of the sheet.

But while the maps relate to Britain alone, and while we may obtain a good deal of information about the geography of this region from them, the maps suggest that we cannot think of Britain as a land by itself, an idea which is right geographically and morally. How do these lines which separate the two areas on each map lie outside the map? Produce them onwards on a map of Europe. We see that it is probable that on 1st July the sun rises at Wick not only earlier than it rises at Yarmouth, but earlier than it rises in Greece, while on a globe it appears as if the sun rises at Wick before it rises at Zanzibar. On the 1st of January again it appears that the sun rises over half of South America before it rises at Wick. All these are striking facts.

With the introduction of the globe the "line" with which we have worked may be transformed into a great circle, and the great circle, partly a sunrise line and partly a sunset line, should if possible be exhibited by placing the globe in the sunshine in such a way that Britain lies horizontally, and the meridian of the point of observation lies north and south.

Then the sun will have precisely the same relation to any point on this globe as it has to the actual spot which it represents. If we find the spot on the globe where a pencil vertical to the surface casts no shadow, that and no other is the precise spot on the real globe where the sun is overhead at that moment. We can watch in a few minutes the sun, the real sun, rising over some portion of America or setting on some place in Asia, as shown on our small globe; and we know that at the real places of which we have representations on our globe, these things are happening.[1]

Keeping the axis fixed in this position we can rotate the globe till Britain occupies the position with reference to the sun which the real Britain had that morning, and check the result by our map. We can rotate the globe till we see Britain in its sunset position. We can, if we so desire, go on to find out at what point the sunrise line becomes the sunset line, and what the sun in the heavens would appear to do at that point. All this later portion of the work may, of course, be done without having done the preliminary map-work, but there is no doubt that the preliminary exercise makes the work with the globe much more real. Whether the preliminary exercise is done or not, observations on the globe may go on all the year.

[1] Some may be shocked by the suggestion that we seem to imply that the sun goes round the earth. As to this much may be said, but we shall say only this. First, we do not assume anything but what we have stated, that at any time the sun has the same relative position with reference to each point on the globe as to the point which it represents. Secondly, that so far as the so-called explanation of the seasons is concerned, it is simpler to assume that the sun does go round the earth. Thirdly, that as a matter of fact the sun goes round the earth just as the earth goes round the sun. When a fat man and a slim lady gyrate on a dancing floor each goes round the other.

They need not take up much time and are extraordinarily interesting. If the globe be left with Britain horizontal, as described in the beginning of the last paragraph, exposed to whatever sunshine these islands afford, it will always exhibit the relation of the sun not only to Britain but to places all over the world. The extraordinary difference between days in our land and in equatorial regions comes out. We note the even length of the days in the latter with the sun rising at or near six o'clock in the morning, and setting at or near six o'clock in the evening all the year round. There are none of the long summer evenings for outdoor recreation lasting till eight, nine, or ten o'clock. Darkness comes on suddenly, and even at midsummer it is dark by seven. The seasons in different parts of the world acquire real significance, while it may also be pointed out that we here provide material which may be taken up in mathematical lessons which deal with the action of the sun-dial.

We have dealt with this case at some length because it affords an example of method, and shows how both particular exercises in map-work and problems of general geography may be taken with advantage in connection with particular regions.

We have to make maps not only from climatic data but from economic data. Here the problem is somewhat different. Climatic statistics are obtained from particular stations; economic statistics normally apply to areas. We find the number of acres of wheat, or the number of bushels of wheat per acre, or the number of sheep in a county or country. In this form we cannot easily represent the facts on a map. We might use the dot method by which one dot on a map stands for so many sheep, or so many acres of wheat. But the success of this method depends entirely on the uniformity in size of the dots made and on exactness in plotting the necessary number. The extreme care that is required makes this method unsuited for school use. It would be possible to plot the number of sheep in each county on a map of England, and shade the counties according to some scheme. But such a map would not bring out the essential facts. Yorkshire is much larger than Rutland, and naturally as a result of this fact has more sheep. In order to obtain some idea of the distribution of sheep in Britain, a little preliminary arithmetical work must be done. We must for each county find out how many sheep there are on the average per acre or per square mile. These numbers may then be plotted on the map and the map dealt with in order to make the facts stand out. Practically all economic statistics must be treated in this way before they are used.

The problem thus resolves itself into a determination of the order and methods by which this kind of work may best be done. It is obvious that again simple cases come first. Also it is evident that while many economic maps may be referred to in class, yet it is not worth while to construct more than a few, just enough to allow the pupils to understand the advantages and limitations of this method of cartography.

At first, then, it will be convenient to select an area with few subdivisions; both the area and the subdivisions should of course be as small as is convenient. The work should form part of the study of a particular region, and the form which the work takes will depend on the region studied. We shall assume for the sake of example that the region studied is the United States. We then select New England and make a population map of the six States—Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, and Connecticut.

First we ask our pupils to divide a piece of paper into four columns and to head these successively with *States*, *Area in sq. miles*, *Population*, and *Number of People per sq. mile*. Then they look at a map of the United States and find the names of the six States in New England. These they write down one below the other in any order in the first column. If tables of the areas and populations of the several States of the Union are available in their text-book, it is well to let the pupils again pick out the facts from the tables for themselves in order to fill in the second and third columns. If such tables are not available, the facts must be supplied in some other way. At this stage calculations must be made in order to get the figures for the last column, approximations being encouraged. Then, perhaps on the other side of the sheet, a map of the six States is drawn and the index figures from the fourth column inserted in their correct places. An appropriate scale of hatching must now be constructed (see p. 151) and each area marked with the hatching to correspond with its index. The title of the map is inserted.

Then follows a discussion of what the maps show. Obviously there are far more people in the southern portion of New England than in the northern. Suggestions as to the conditions which have led to this result are asked for and discussed. Questioning, too, will lead to an understanding of the fact that the map does not tell the whole truth, as it suggests that the people are spread evenly over the whole of each State. The probable distribution in the region is deduced from what has been already noticed as to the general facts. Finally, a short summary of the conclusions come to is written by each boy or girl, either below the map or below the table first constructed.

Later, similar work may be done for the Middle Atlantic States or for the Southern States. Not only is the mechanical work a little greater, but we can compare the results with those found after a study of New England, and the whole matter can be carried a step forward. As, however, fewer explanations of the preliminary work are necessary, and some of the conclusions are similar to those already found, the actual time taken by the exercise should be no longer.

If thought desirable further work may be done for other blocks of States of the Union. The same work may be done by each member of the class, or the class may be divided into sets, and each set allowed to work out the facts for a particular region of the whole.

Following on such work we might have a number of products mapped when studying India in a succeeding year. Whether the class has been divided previously or not, here certainly this might very well be done, each section being concerned with the mapping of one product and the results discussed by the class as a whole. On the face of it this work does not present more difficulty than that already done. But two differences, if not difficulties, occur. One is that while in the United States people do live all over the country, yet in India some products are not found or grown over the whole land. The production of rice, for example, is restricted for the most part to one or two States. This condition would probably cause some trouble if it occurred in one of the first exercises attempted. Further, there is this difference that there *are* statistics of the population for each State of the Union, while in the Native States of India no statistics of any kind may be available. This again is a disturbing fact. But if it is disturbing it is necessary that it should be faced and realised, less perhaps because of its importance in the geography of India than because it throws a lurid light on the reliability of many maps.

We have already said that work of this kind with economic maps should not be overdone, and probably the amount desirable is about that of which we have now spoken. It may, however, be supplemented later by investigations which go into more detail. For example, a map of England or of the British Isles may be constructed showing the distribution of wheat. Here county statistics may be utilised, and much more accurate work may be done than where the unit is the State. A good deal of purely mechanical drudgery is, however, entailed, and this may not be thought desirable, though it should be remembered that such work does once more drive home the fact that an immense amount of labour is necessary before accurate maps are made.

Having now dealt with the making of maps from data supplied, there remains the making of maps from data obtained by the pupils. The region for which this is possible is obviously the home region, and the work must be of the nature of a survey. It is of two kinds, according to whether the observations are made by eye or by the aid of instruments. Instruments may be used to make a survey by ordinary triangulation or similar methods, or they may be used to run lines of levels, and hence find the relief. Of this we shall give an account in the chapter on "Home Geography." We shall only point out here that perhaps the chief value of such work lies again in the fact that it presses home the necessity for co-operation. But instrumental work is by no means all that may be included in the term "surveying." Indeed it is probable that by means of eye observations boys and girls may do a great deal of work which is both more useful and more geographical than that done by instrumental means. In the country we may plot on 6-inch maps the crops actually growing in the fields, or the number of animals grazing, or the kinds of wild flowers found in different spots. In a town we may plot the shops and residential areas, the public-houses, or open spaces. This work can be done at intervals through the course, some of it before much of the other mapping suggested above is attempted, and it is of importance both as giving that map-work a sense of reality, and because in itself it is worth doing.

Such maps as those of which we have spoken are in the main distributional maps in which areas are emphasised. We have, of course, also others in which position is emphasised, in which one place is shown in relation to other places and surrounding conditions. The very first map that the pupil draws is a map to show position—the position of his desk. There are two kinds of positional maps, network maps and those in which the position of a place is referred to actual objects, and the tendency is to confuse them.

The first type is represented by the ordinary atlas map which has a great many places marked, and a network of lines by the aid of which and an index the position of a point may be stated and found. In some maps of this type there is a network of squares numbered and lettered, and the index gives the square by means of two letters or figures. In others, latitude and longitude lines are marked. Maps used in the Great War were ruled in squares, each of which could be identified by a letter. The sides of these squares had a given length, usually 1000 yards, and any point within a given square was fixed by four figures, *e.g.* 4725, which, being interpreted, meant that the point was 470 yards to the east and 250 yards to the north of the south-west corner of the square. It is commonly thought that this gives the position of the point required. It certainly gives the mathematical position of the point *on the map*, but the information must be translated into some other form in order to be useful in real life. It is not much use knowing that a particular street to which we desire to go has a certain latitude and longitude, or that in a town plan ruled in squares it is in that numbered D 7. We require to know something much more vital; we require to know how it lies in relation to other streets in its neighbourhood, and to routes by which it may be approached from the place at which we happen to be. The real geographical position of the street is given by reference to these things that matter.

Maps of latitude and longitude merely supply a method, akin to that employed in a dictionary, of beginning to learn something of a subject. Children should certainly be taught to use a dictionary, and should in fact use a dictionary, but it does not take long to teach the use of a dictionary, and even when it can be used much remains to be done.

There is the second type of positional map which marks position with referencc to things rather than lines. As far as the use of networks is concerned in locating places, very little teaching is required. But a great deal of work is required in teaching boys and girls to read maps and to select the facts about the position of a place which really matter, and to express those facts in map form, just as work with words in sentences takes a long time, and much teaching is necessary. This type of positional map is more difficult, but it has a much greater value than the other. It is more difficult because it deals with the relations of things, that is to say, with real geography, and it is for this reason also that its value is great. It is easy enough to put a dot on an outline map of England for the position of Newcastle, but this does not really show position at all. Facts which are important in the position of the city are the Tyne gap to the west, the existence of highlands to north and south which have allowed and induced the making of roads and railways and bridges most conveniently just there. The coalfield on which the city is placed and the river dredged by man are also significant. All these must be indicated on a map which really shows the position of Newcastle.

We have pointed out that our geographical work begins with this type of map, and it has increasing value as geography is more and more understood. Work with such maps as show relationships is necessary all through the course. Sketch maps to show relationships should be continually used. A map showing the position of a town is a shorthand note of matter which might take up several pages of text, and sketch maps of town sites are very simple examples of such positional maps. It is stupid to think that a child can really understand the complexity of an atlas map with its multitude of facts all presented at once, and with the same emphasis, unless the work is simplified at first. It is only by trying to understand individual positions that the atlas map can really be read.

In concluding our discussion of map-reading let us return to our comparison with the teaching of print. While it is true that many people do not read enough, it is equally true that many people read too much, in the sense that they read more than they can assimilate. Time is required for reflection on what is read, for examination of new material in order to fit it into our previous body of knowledge, for examination of new ideas to see how they stand the tests we may apply to them, and to see how they modify our old ideas and are modified by them. Equally in map-reading is it necessary to leave time not merely for reading but for reflection in order to *think* the material which is in map form into concrete actualities in our minds. Of course, this is not easy, but if the best is to be made of maps such thinking is to be encouraged. It is precisely in the endeavour to think in actualities that the difficulty of geography lies; it is precisely because this is an intellectual exercise of a high order that geography as a study is the equal of latin or mathematics at their best, and it is precisely because attempts are always being made to find some easy way to the desired end that much of geography, as of latin and mathematics, is of no use at all, for there is *no* easy way.

We have already said that our aim in teaching map-reading is to use a map as we use a binocular; we look through it, not at it; by looking at it not a bit of good is done; by looking through it things far away are brought close at hand. The habit of reflection after reading a map is of enormous help in thinking through a map. This habit is obtained in our pupils by suggesting the right attitude of mind rather than by saying anything; it follows that if it is not the teacher's habit it will not be the habit of the pupil. It is for this reason that teachers who have this habit should teach the very youngest children as well as the oldest. Indeed, if the children have not begun to look through maps in a very real sense in their first year, it is doubtful whether they will ever be able to look through maps easily. In the case of the early maps of the series suggested the difficulty is not very great, but serious reflection as a definite willed action is more and more necessary in succeeding years if map-work is to help the study of geography as it ought to do.

CHAPTER XIV

ATLAS, WALL-MAP AND GLOBE

SOONER or later every geography teacher accumulates a good deal of map material for class use. He may supply graphed copies of maps to his class in order to illustrate particular points or show particular relations, but such maps are all supplementary. They presuppose an atlas with a supply of maps which are likely to be generally used by the class.

How is an atlas to be used ? At first as we have suggested, not at all. While the pupils in the first part of the first year are engaged in making maps of the district immediately surrounding the school, there is neither the need for, nor the possibility of using, an atlas. Later when the home region is expanding to the British Isles an atlas could certainly be used ; it would, however, be of such a special kind that it would be difficult to construct, and as a matter of fact no atlas at all suitable exists.

Later, when the world is studied, atlases may be used, and we are faced with the question with which we began the last paragraph. There are in fact some three or four chief uses of an atlas. First, it is used for reference. It is in some sort a dictionary. New names and new relationships should always be identified on a map. Exceptions there may be, but especially in junior forms it is a fairly safe rule to have every name used in class identified on a map. This map is generally in an atlas. Facts that are represented on maps should be identified in the same way whether they have names attached to them or not. This means that the atlas is in constant use. Nor is it only one map that is to be used. There is something wrong with the teaching when one particular map in the atlases bears signs of wear and the rest are beautifully clean. When such a state of affairs holds there can have been no effective cross-reference.

After having been used in the first instance for reference purposes the atlas should then be used for map drill. Geography which is all map drill is not geography at all, but geography which has no map drill is pretty certainly of very little account. It is one of the weaknesses of the new geography that map drill has gone out of fashion. It is certainly true that the better the teaching the less need there is for much map drill, but even with the best teaching five minutes of it now and again, especially again in the lower classes, is useful out of all proportion to the time spent. No pupil can escape as so many do when the class has much oral teaching. A name is called out and fingers point at once to the spot on the map. At first a few will be ignorant and all will be slow. A long pointer is a help as the teacher can indicate the name (it is taken for granted that the teacher knows the map "upside down!") to particular pupils without much movement. Another name is identified in the same way, then the first again, then, in rapid succession, the second, a third, the second, the first, a fourth, the third. The pupils quickly respond. The feeling that they know something accurately is of very considerable account and has its effect on the general geographical work, while time is saved in looking up references during lessons.

Thirdly, the atlas may be studied (p. 187). As we have suggested previously selections may be made from it in order to emphasise particular facts. From the nature of the case an atlas always shows a great many facts, and it is often difficult to see the wood for the trees. If one or two facts are selected from a map, it is more clearly grasped that those facts are shown on the map in combination with others, and the meaning of the map as a whole is better understood.

Lastly, the atlas maps may be used either in combination with each other, or with maps which are supplied, to show relationships that are not otherwise apparent. Of this also we have already spoken, and there is no need to say more.

In order that the atlas may be used for these purposes it must fulfil certain conditions. It must be suitable for the age of the class. We have said that we presuppose the atlas to contain maps which are generally used by the class. Obviously the atlas which is likely to be generally used by a class of average age ten ought to be different from an atlas to be generally used by a class of average age fourteen or sixteen. In secondary schools different atlases are for the most part used by pupils of different ages, but in primary schools the same atlas is generally used in all classes. The use of the single atlas may be defended on grounds of economy; but one could not defend the use of the same arithmetic book or the same reading book all through the school on the ground of economy, and it is doubtful whether the argument is valid as applied to atlases. It may be defended also on the ground that a pupil of fourteen knows little more than a pupil of nine or ten, and that there is therefore no need to supply different atlases. This may be sufficient reason as far as the supply of atlases is concerned, but it suggests that there is certainly something wrong if the facts are as stated. In any case, under satisfactory conditions the atlases should be suited to the different ages and classes.

There are, however, certain characteristics which no atlas should possess. The existence of any of those characteristics should at once disqualify an atlas from being used in school.

(*a*) No maps should show highlands as lines even broadened or broken. The reason for this we have given elsewhere (p. 129).

(*b*) No maps should show highlands as "caterpillars." Hill-shading is another matter and when well executed is very satisfactory, but it is rarely well done, and few, if any, atlases otherwise satisfactory employ the method.

(*c*) No maps should show highlands by photo relief. The same objections may be raised against such maps as can be raised against picture maps and most models, that while they are speciously more like the reality than are ordinary relief maps they in fact give more wrong impressions, as highlands are shown as exaggerated in height and with impossible slopes.

(*d*) Atlases should be disqualified in which are definition maps which purport to show the realities corresponding to certain geographical terms—an estuary, a delta, a peninsula, a port, a glacier, a volcano, and an archipelago. There is probably no page in any geographical work which contains more mis-geography in a smaller space. It is rivalled only by the *Swiss Family Robinson*, which has admittedly other claims to consideration. The port is at the end of the peninsula, the estuary and delta are alongside one another, the desert is a mile or two in width and within a short distance of the port and the glacier. With the silent witness of such a page in an atlas it is very difficult to teach that ports are as far inland as possible, that estuaries occur where there are tides, and deltas where there are none, while ideas of scale and climate, not to mention common sense, are knocked on the head by what the diagram states as to the mutual relationships of glacier, desert and port.

(*e*) Atlases should be disqualified which have an excessive number of political maps. Some political maps are useful and even necessary in later school work, but in atlases for lower classes they are out of place. Even in atlases for upper classes probably all that is necessary is that political boundaries should be inserted on orographical base maps. So marked, political divisions mean a great deal more than when political maps are constructed without any background. Whether we are dealing with English counties or with countries such as France, the political geography is seen to acquire significance which is entirely hidden on a purely political map. In fact the study of English counties, not to speak of other areas, may become quite fascinating when orographical maps are used.

(*f*) Nor must atlases have maps overcrowded with names. Something may be allowed for idiosyncrasies of particular teachers, but even so there is a certain general agreement as to names which can possibly be used in class and the number of names is really very small. In atlases for lower classes there need be very few names indeed. In this as in other respects there has been a marked improvement in recent years, but there are still too many names on maps which are used by those who are just beginning to use atlases.

(*g*) Finally, any atlas which employs Mercator's projection for any kind of world map has a very serious blemish, as it suggests so much wrong geography by its mere presence in an atlas ; and it is certain that no atlas should be used in which that projection is employed for distributions in which area is important, *e.g.* the British Empire or population.

We have spoken of disabilities. On the other hand, there are certain positive qualifications which school atlases should possess. Maps should be predominantly orographical, relief being shown in browns and greens or in the chromatic scale. Difficulties of course arise when considerable differences in relief have to be shown. The greater heights may be too dark. Even so it is probably better to have these darker tones than to have reds and pinks which suggest lower land. The higher land is almost invariably unimportant in itself, and the darker tones need not seriously interfere with the printing of the few names which have to be used. Probably the last word has not been said on the selection of suitable contour lines for layered maps, so that the important geographical facts may be shown up by the fewest contour lines. It is also to be noted that the degree of accuracy varies very considerably in atlases. Obviously the more accurately the relief is shown, the more likely is the atlas map to be suitable for a number of purposes.

While atlas maps should be predominantly orographical, and while in atlases for lower classes no great harm is done if they are entirely so, yet for upper classes a considerable number of other maps are necessary and the number increases with the age of the pupils. These other maps are, at least at first, mainly climatic. Annual averages, however, are of little use. The least that can be asked for is that there should be two maps, either summer and winter or January and July, to show the average temperature and rainfall of the world, and that similar maps of different regions should also be provided. Even so this provision seems inadequate. Work in upper classes requires more detailed knowledge of how temperature and rainfall are distributed through the year. Also though maps are useful in which temperatures are reduced to sea-level, they may from a geographical point of view be very misleading. It is very desirable to have maps which show actual temperatures. Further, temperature and rainfall are by no means the only factors of climate. Maps showing humidity are probably not yet available, but there ought to be maps to show sunshine and cloudiness.

Maps of wind directions are usually given in atlases and are useful, but few of these maps are really satisfactory. Apart from the fact that they all show average conditions and average wind directions, they are particularly unsatisfactory in that they rarely suggest that there are currents of air, nor do they show how steady nor how strong the currents are, all important facts. Average pressure conditions, reduced to sea-level, are also usually given in atlases, but to a thoughtful mind there is an ever-present doubt as to what they really show, and even whether they show anything that is true. In any case pressure, winds, and rainfall should not be shown on the same map.

Besides maps showing climatic factors other non-orographical maps are necessary for upper classes; vegetation maps and maps showing population distributions are probably the most important. They are, however, of a type of distribution for which is usually reserved a special atlas, that showing economic facts. The problem of how to show the economic facts which are wanted in the upper classes of schools has not yet been solved satisfactorily. One could not study the relief of a country satisfactorily if the only relief map available was one of the world. The same is true of commodities. But comparatively few commodity maps in school atlases, even economic atlases, are shown on a larger scale than one necessary to show the whole world. For the present, schools have to do with something less than the best.

It is desirable also to have, at least in the upper classes, an atlas in which the separate regions of the British Isles are represented in some detail orographically. There should certainly be a map of the British Isles as a whole. It is arguable whether there should be separate maps of England, Scotland, and Ireland. The temptation to the map-maker to draw the map of England on a different scale from that of Scotland is often too great, and we have already pointed out that the representation of Scotland and England separately has resulted in a mental habit on the part of many people of thinking of these lands as in some way separated physically. However that may be, it is most desirable that there should be maps showing Wales and the north of England. The remaining portions of the British Isles should be represented on the same scale as are these.

Further, it has already been suggested that the home region has a special importance in the teaching of geography. To this point we shall return, but here it must be pointed out that it is desirable that there should be maps of the home region in atlases, as they are or should be "generally used by the class." It is probably impossible that each school should have maps of the area immediately surrounding it, but something more might be done than is done. It is indeed desirable that there should be a whole series of maps on gradually decreasing scales. This has been provided in a Viennese atlas, with Vienna as the central area, and in other continental atlases, but little quite similar has been attempted in this country. In some atlases, however, provision is made by local editions for the study of the home region in somewhat greater detail than is necessary for the study of other regions; in these local editions maps are given which show not only the relief but other distributions also. This is all to the good, though the distributions are usually such as are more useful for upper classes.

Finally, it should be said that it is desirable to have maps with pleasing colours and technique. British atlases of the better sort reach a very fair level of excellence and compare favourably with those of most other lands, but in the matter of colour can scarcely be said to be in the very first rank. Pride of place in this respect is certainly held by some of the Italian atlases.

Then in addition to the atlas we have the wall-map. The atlas is however fundamental; if the choice lies between atlas and wall-map, we should certainly choose the atlas. When the wall-map is used alone, the class is thought of as a class; when the atlas is used, work is done by individuals, and every teacher knows which is the more valuable method. At the worst, however, wall-maps may take the place of the atlas though that is not their real function.

They have in fact two functions. (1) One main use of the wall-map is to help the pupils to see facts that are to be specially noted on their own atlases. For this purpose it is an advantage if the wall-map is an exact duplicate, except for size, of the atlas map. (2) But another use of the wall-map is to show facts *not* shown on the atlas, in text-books or in forms otherwise available to the class. Wall-maps of the former class are to be had, if they are to be had at all, from map publishers. Maps of the latter type may very often, probably most often, be made by the teacher. It may be pointed out, however, many of those made by teachers might as well be made in the form of lantern slides and so save storage room.

The difficulty of exhibiting wall-maps still continues to a greater or less degree, and it is not normally the use of wall-maps that wears them out, but their abuse. In far too many class-rooms maps are still flung over the back of an easel blackboard, and are worn out long before their time. Apart from the fact that this throws the blackboard out of action just when it is wanted, it helps to wear out the map quickly by crushing the printed surface.

In other class-rooms maps are suspended on makeshift hooks. This in itself is, of course, no bad thing, but it is often done so as to hide a fixed blackboard. The trouble is that usually class-rooms are not planned with the idea that maps may be used, and there is no provision for them, while the idea that more than one wall-map may be used at a time has scarcely become a normal one even with teachers.

The most satisfactory scheme is to have a wooden batten suspended from the wall near the ceiling; maps may be fastened to this batten and drawn up by pulleys clear of everything else. Indeed, a series of battens is better than one, as it is then possible to exhibit an adequate number of wall-maps. Perhaps it may be useful to point out that the cords by which maps are usually suspended may be done away with and a considerable amount of petty irritation saved by a little initial trouble. If the suspension rings on the maps are arranged at some standard distance, or at some multiple of that distance, and hooks inserted in the batten at the same distance, then the rings may be slipped directly on to the hooks. For example, the rings may be at distances of 1 foot, 2 feet, 3 feet, or 4 feet on maps of different sizes; if hooks are inserted in the battens at intervals of a foot any map will fit. As a matter of fact 18 inches makes as convenient a standard distance as 1 foot, and the rings on most maps will be either 3 feet or 4½ feet apart.

When wall-maps are mounted to fold, the eyelet holes are not usually at any standard distance—if they were it might be taken as the distance between the hooks; but these maps can easily be fastened to the battens if sufficient space is left beneath the line of hooks.

Wall-maps tend to be abused even when they are not used. Those on rollers are rarely rolled *tightly* enough, and the cord by which the map is tied crushes it badly if the latter is at all loose. After a wall-map is rolled up, the projecting end of the roller should always be turned round within the roll as far as it will go to tighten the map still further. It is surprising how much this does both to tighten the roll and to preserve the map. In one school where this has been done for nearly twenty years, the maps in regular use are in very much better condition now than maps in many schools where they were new only a year or two ago.

We have said that the wall-map comes second to the atlas. This is true, but not the whole truth. There is, in fact, another appliance, the globe, which comes before the wall-map, and indeed for some purposes comes even before the atlas. The use of the globes was one of the subjects taught to genteel young ladies in early Victorian times, but the advance of education in later years seems to have crushed one of the few valuable means of instruction of that time, and for a generation or two the globe has not been studied. Yet it is by its means alone that we can see the physical unity of the world. Otherwise we study scraps. By means of a globe we can see the relation of one part to all the rest, we can see that in reality no part is independent of any other. Individual maps, even world maps, if they show any relationships at all, cannot help but show some that are absolutely untrue.

Globes have indeed also been used for purposes for which they are entirely unfitted, but that is no reason why they should not be used for purposes for which they are entirely fitted. It is ridiculous to use a globe to show orographical features even by colouring. If one wishes to show relief it may be shown very much better on a map. It is a refinement of the ridiculous to have a globe on the surface of which the highlands are shown in relief. Even Mount Everest is only $\frac{1}{2000}$ of the earth's diameter in height, and on a globe 18 inches in diameter would be represented by a height of less than $\frac{1}{100}$ of an inch. The globe is indeed a great deal smoother than the proverbial orange, and a totally wrong impression is given if there is any roughness at all on the surface.

The globe should rather be used to show facts that *cannot* well, if at all, be shown on an atlas or wall-map, simple big relationships which are easily missed, like the relations of the continents and oceans, the "direction" of one part of the world from another (p. 27), such facts as that the shortest way from Peking to New York lies through Bering Strait, or the relative value of routes to "the East" by the Panama Canal and Cape Horn, by Suez and South Africa. On a globe too can be shown large climatic and vegetation distributions in their true relationships.

This implies a globe with certain characteristics. It should be large enough to be seen clearly by each member of the class. Also it is obvious that it should be a blackboard globe if it is to show all the different world distributions which we may wish it to show. It is also well if it is suspended from the ceiling. Where geography is taught in different class-rooms the globe must be portable; but a portable globe on a heavy stand somehow suggests many wrong ideas which are not quite so obvious when the globe hangs, as it may do, in a room specially set apart for geography.

It is sometimes convenient to have the continents permanently marked in white, and if this is done it is almost all that need be done, but even this is unnecessary; if the outlines of the continents are incised, the areas may quickly be chalked in when required, and often it is convenient *not* to have the continents too obviously marked. It is also convenient to have the lines of latitude and longitude at each 10° or 15° also incised. They are quite inconspicuous, but can be used if and when necessary. It is in connection with the globe that lines of latitude and longitude acquire significance.

Such a globe is invaluable at every stage of school work in pulling together important facts which otherwise are left unconnected and thus robbed of a great part of their value. The danger in the use of the globe as in that of the map is that the image may be mistaken for the reality. For this there is no safeguard but good teaching, which insists all the time on using the image to enable us to imagine the reality. Without this the globe like the map may be worse than useless.

CHAPTER XV

MATERIAL AIDS

IN the teaching of geography as in the teaching of all other subjects, one must vary the teaching as much as possible. Since geography is essentially a subject dealing with space relations, one of the most important forms of appeal is to the eye by means of pictures and diagrams as well as by the printed word. The methods by which this appeal may be made are very various; each has its special use and function, and in this chapter we shall endeavour to state what that use and function is.

1. First there is our old friend the blackboard. A blackboard never looks very inspiring, but properly used it may be most inspiring, not to say dramatic. It is the kinema of the class-room. It is there to have things written on it, and equally, though this is often forgotten, to have things rubbed off it. The enormous advantage of the blackboard is that on it things may happen; on it a map or a picture may be built up in front of the class, with or without the assistance of the class. Other maps and pictures are presented complete and unalterable; those on the blackboard may always be modified. On the blackboard, by example rather than by precept, one may teach *how* a map should be drawn, and that it may be

drawn quickly. Incidentally it may be pointed out that if these desirable objects are to be accomplished the teacher must not draw the map beforehand, nor must it be drawn by constant reference to a book, or to notes, in front of the class. By drawing maps beforehand or by using notes in front of the class, the most important fact taught is that this map-drawing is a very difficult business, and the corollary follows that as the teacher evidently cannot do it, the pupils cannot be expected to do it either. This is by no means what we wish to teach. The map must be drawn *coram publico* as a guarantee that the thing is possible. The same is true of work written on the board.

But the fact that what is written or drawn must be rubbed out implies that the blackboard is entirely unsuited for elaborate work which requires time. Illustrations of this latter kind should be presented in some other way. The blackboard is being put to a wrong use when there appears on it such work with a legend attached, "Not to be rubbed out." One suspects that when illustrations are left over from one lesson to another, and still more when they are left for a week or two with this legend, that the artist had another object than the instruction of his pupils.

The chief use of the blackboard then is for comparatively rough work—map, diagram, or sketch, in which the emphasis is on the method by which it is built up. If the illustration is elaborate, and especially if its value is entirely as an illustration, it is unsuited for the blackboard. To put it in another way, the blackboard should be used for such illustrations as are not worth keeping, and should not be used for such illustrations as are worth keeping.

2. Of course it is necessary to have more elaborate and more accurate pictures and maps than can be drawn on a blackboard. Such maps and pictures may be bought or may be carefully drawn. If they are large enough to be used for class, as distinct from individual, teaching they must be of considerable size. A few may be framed and hung round the walls of the room, but we require many more pictures and maps of this kind than any school is likely to acquire for wall decoration, and apart from the facts that they are awkward to handle and awkward to store, it is extremely difficult to procure large pictures of this kind, and it takes a long time to make them. Certain typical views and diagrams should certainly be framed for reference. Outstanding work by pupils might be treated in the same way for example and encouragement, but this is about as much as can be done.

If large pictures and maps are not framed, the matter of storage is slightly easier. Shallow drawers serve as the most suitable storing-places; if the drawers are too deep difficulties occur; the particular chart wanted is by some fatality always at the bottom, and the physical strain of holding up those above in the process of finding it is considerable. It is, however, of enormous advantage to a school to have a collection of pictures and maps carefully classified, so that it is very much more useful to have a number of shallow drawers than a few deep ones. The particular illustration required is likely to be found much more quickly.

If these illustrations are used to any considerable extent it is well to have them backed with butter muslin. The operation is quite easy if one remembers a few points: (i) paste the paper surface; (ii) use a piece of butter muslin somewhat larger than the paper, lay it *very* lightly over the pasted paper, and then stretch the muslin over the latter; (iii) work from one edge to the opposite one, using a squeegee or cloth; (iv) pay particular attention to the edges, seeing that the paper adheres to the butter muslin; (v) press the sheet while it is damp (two blackboards do very well); (vi) cut the extra muslin along the edge of the paper when both are quite dry.

The wall-map has always been something of a problem. The days are over when the only maps to be obtained were political maps of the continents and of England. There are now many series of relief maps and of climate maps. Other distributions are not so well represented, but the teacher of this generation cannot complain, as the teacher of the last could, that the supply of wall-maps is inadequate. Here, perhaps, is the place to point out also that half-inch to the mile maps of Great Britain make very effective wall-maps of particular regions when used in groups or even singly. They may be fastened together temporarily to form different combinations. It is noticeable how little the border strips of white interfere with the general effect.

The storage of wall-maps has always been a difficulty. The introduction of folding wall-maps, which may be stored in drawers, has partly got over the trouble, but the system which Prof. Herbertson adopted for roller maps thirty years ago and more, and which eliminates most of the difficulties of storage of those maps, is not well known. Shortly, the principle is to insert cup-hooks in one end of each roller and to hang the maps from other cup-hooks in the map-cupboard. These latter cup-hooks are inserted in the "ceiling" of the cupboard in slanting rows as in the diagram (fig. 31). Each map has then a definite place and is clearly visible when the cupboard is opened. If each map is lettered and numbered it can be easily taken out and replaced, and another source of wear and tear in maps is eliminated.

3. Besides large pictures and maps framed, or unframed, small pictures and maps are also useful. Here the difficulty is not that there is little choice, but that the choice is very extensive. But there are few col-

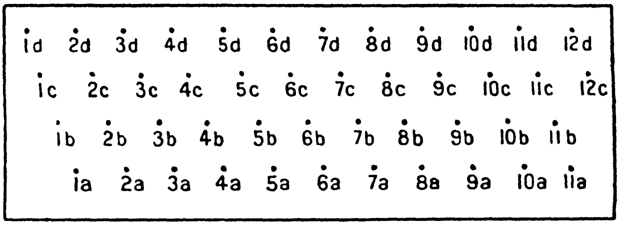

FIG. 31.—Diagram of a map-cupboard.

lections of pictures. The atlas is of course a necessity and provides a few standard maps for everyone; a picture-book is equally desirable, but unfortunately an entirely satisfactory one does not exist. One or two series of hand pictures of special subjects are published, and a few maps and pictures are available in the text-books in common use. Normally, however, even when collections and pictures are available for each member of the class, they cannot be easily used in class-teaching. It is always difficult to ensure that each member of the class is looking at the precise point to which the teacher desires to call attention.

Very small illustrations, such as postcards, are useful however if they can be studied by individuals. A collection of small pictures and maps is not a difficult matter, and all is fish that comes to the teacher's net; illustrated papers, missionary magazines, trade advertisements, tourist books, postcards may all supply their quota. It is the storage and exhibition of these pictures which will give trouble. To take the latter first, it is probably best to have a definite place reserved for such small pictures as illustrate the lessons which are given. It is sometimes useful to have a short length of expanding wood trellis on which to fasten small illustrations with drawing-pins. This is specially suitable for pictures of ephemeral interest.

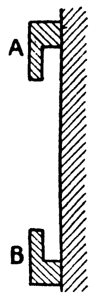

FIG. 32.—Section of holders for small pictures.

But the author recommends that, wherever there is a room specially set apart for the teaching of geography, considerable wall space should be reserved for the exhibition of small illustrations. A convenient way is to have the small pictures pasted on to cardboard mounts which may be slipped behind holders in the wall. These mounts must, of course, be of the same height, but may be of any width. It saves some trouble if the height of the mounts is half the width of an imperial sheet of the cardboard used, and the holders are made to suit the size. Two rows of pictures may then be exhibited. A and B (fig. 32) are sections of slight pieces of wood fastened to the wall in suitable lengths. Fig. 33 gives the dimensions of A: those for B are identical. Behind these the pictures are placed.

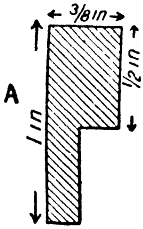

FIG. 33.

In exhibiting pictures in this way it is most important not only to have a title for each, but to add a note pointing out what points are specially to be looked at. Indeed this supplies a criterion for the selection of pictures. If there is little in the picture that is specially to be noticed, it is probable that it had better be suppressed and its place taken by another.

The essential point to secure in storage is that the pictures may be accessible. This implies some kind of orderly arrangement. There is much choice as to the basis of the arrangement. The pictures may be classified regionally or according to subject-matter. In practice it will probably be found that when a considerable collection has been got together, the most satisfactory method is to classify the majority of the pictures and maps according to lessons. Those illustrating a particular group of lessons with a particular class will be kept together, brought out when the lessons are given, and taken down to make way for another set when they have served their purpose.

4. The stereoscope is another "material aid" which is not to be despised. The chief, if not the only, objection to its use is its cost. The ideal outfit certainly costs a good deal, but even a single stereoscope and a single slide are worth having. The advantage of using the stereoscope is enormous and is not realised by those who have not actually used it in teaching. It gives an air of reality that nothing else does; no one who has heard a class exclaim with one voice, "Oo—oo! it *is* real," could doubt of its value in this respect. This of itself is of enormous importance in a subject where reality is so necessary and so difficult to obtain. And not only does it give the impression of reality, but it

enables children to understand what certain things look like in a way that other pictures do not. It is specially valuable in showing mountainous countries. By its use mountains and valleys really look like mountains and valleys.

No class in the upper school, or even be it whispered of advanced university students, can resist the appeal

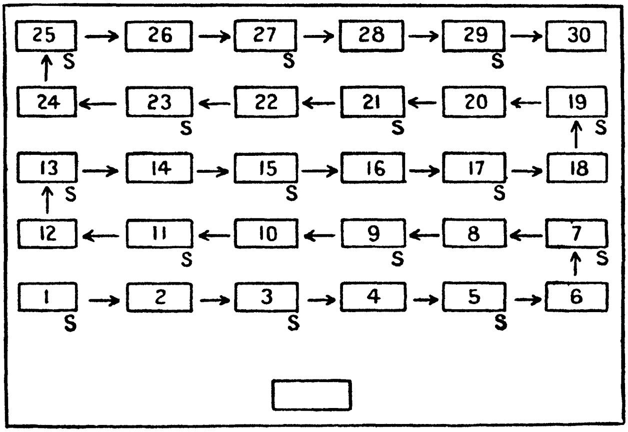

FIG. 34 —Plan of room for thirty pupils, with fifteen stereoscopes distributed among them.

of the stereoscope, and a good deal of serious work may be done with it, but its special use is with younger children in giving qualitative ideas of different regions. In particular, it is invaluable in the first or second year. For this purpose it will be found that it is quite sufficient to have from ten to fifteen different pictures of each of eight or ten regions. Among the regions represented, Norway, Switzerland, Japan, Greece, and Egypt should certainly be included.

As to the method of use there are a number of difficulties, but a little care in organisation is all that is necessary in order to obtain good results. Let us take a particular case. Assume that fifteen stereoscopes and fifteen pictures are available, and that the class numbers thirty, arranged in five rows of six, as in the diagram (fig. 34). The children will be given some more or less mechanical work to do, such as the drawing of a map of some area which they know, then stereoscopes with pictures in place will be distributed to alternate children as in the diagram, where "S" represents a stereoscope. The method of procedure will be explained to the class; they will be told the name of the country, say Greece, of which they are to see pictures, and those who have stereoscopes in front of them will be told that they can look at them and that the others will see the pictures in turn.

There will probably be considerable natural excitement, and the teacher will be in great demand to be shown the wonders that are to be seen. At the end of a minute or so, the instruction will be given to pass on stereoscopes and pictures to the next in order. If the odd numbers on the diagram have seen a picture it will now be the turn of the even numbers. At the end of another minute the stereoscopes may be again passed on. The numbering is such that No. 6 in the front row has to pass back to No. 7, without any movement from his or her seat. The teacher may take the stereoscope from No. 30 to No. 1. Proceeding in this way each member of the class may see each picture in a little over half an hour. If the lesson is longer, the time allowed for each picture may be slightly lengthened; if the lesson is of half an hour or less, the time must be slightly shortened.

If the class is smaller than 30, say 24, then a smaller number of pictures, 12, will be used; if 20, then only 10 slides are necessary. If the class is really small, 12 or 15, then each pupil may have one. If, on the other hand, the class is large, say 45, then one picture to every three pupils will be sufficient, and the time given to each picture shortened.

The showing of the pictures does not of course complete the work. In the next geography lesson period the children are asked what they know about "The Greeks." This shifts the ground altogether from that usually taken. Instead of the teacher more or less painfully "giving" the lesson on The Greeks, and more or less skilfully supplying the information, the children can tell the teacher what they have seen. The function of the teacher in such a lesson as this is to arrange the ideas that have been acquired, so that they form some kind of coherent whole. One of the least satisfactory parts of the teacher's business is eliminated.

5. A piece of country is scarcely a material aid, it is the thing itself; but an excursion to study a piece of country on the spot is a most useful method of teaching geography. It is imperative that some piece of country should be studied at first hand, but there is the grave disadvantage that an excursion or a school journey takes up a great deal of time, and that even if one spent all the time allotted to geography in taking excursions, one would in fact learn very little geography, for the children would know only a minute portion of the world. Still the excursion has the enormous advantage that it shows things in their real setting and *without any frame.* It is the frame which is the curse of all pictures in teaching geography, for the tendency

is to reach the isolation of facts instead of their relation. A small disadvantage of the excursion is that it is sometimes difficult to get a class to look at the particular feature, perhaps two or three miles away, to which the teacher wishes to draw attention. Various means may be used to lighten the difficulties. The clock method is one; a conspicuous object is chosen as the centre of the "clock," and then the other features are referred to as at three, or four, or nine o'clock.

6. Then there are various kinds of projectors, including the projectors with which we shall deal in a later chapter. Of all the methods of presenting pictures or maps, the most continuously useful is that by means of a projector lantern, whether a diascope (commonly called a "lantern") in which the light goes through the slide, an episcope in which a reflected image is shown, or an epidiascope in which both methods are combined. It has certain disadvantages. The lantern, so it is said, takes a long time to get out of its cupboard and be made ready for a lesson. It has to be cleaned, the different parts fitted together, the screen erected and placed in position, and then when it has been used it has to be dismantled and put away again. There is difficulty in procuring suitable pictures; slides are expensive to buy, and if they are hired a good deal of trouble must be taken in order to obtain just those which suit a particular lesson. There is the further difficulty of not knowing how a lantern works. In truth this is the real trouble. It is not only that teachers do not know the lantern, but that they are usually distinctly afraid of it and of what it might do. It may always blow up or do something equally unpleasant. These are grave indictments. Something

may be said to show that these disadvantages are perhaps not so great as they appear, but before dealing with them let us see what the advantages of using the lantern are. Let us first consider the diascope or lantern.

i. Maps, pictures, diagrams, tables of statistics, etc. once made are permanently available. The alternative is to use the blackboard or to supply each member of the class with the facts individually. In some cases these methods may be convenient, but in others the lantern is the most convenient way of exhibiting facts, and it has the additional advantage that once made the lantern slide is not used up.

ii. Many maps and pictures may be much more easily made into lantern slides than otherwise reproduced on cardboard, paper, or even the blackboard, for they can very often be traced directly on to the glass. Indeed, large diagrams on paper may often be constructed most easily by first making a lantern slide by tracing, and then by projecting the tracing on to a sheet of paper and tracing again.

iii. The cost of a lantern slide is less than that of a full-size map or picture; this combined with the small space required for storage allows of the collection of a large number. Fifty slides take up very little space. They may be stored in boxes or in special drawers in a case. These boxes or drawers should have partitions so spaced and of such a height that slides cannot fall flat on to the bottom of the box. The diagram (fig. 35) shows a single slide in a division. It can be easily picked up, but if AB were longer or AC higher, then this would be difficult. Suitable dimensions are given in the diagram, but these are not invariable: if the distance between the partitions is greater, the height of the partitions must be lower. A convenient box has two or three partitions; drawers may be longer. The boxes may easily be made in the school workshop by boys or girls.

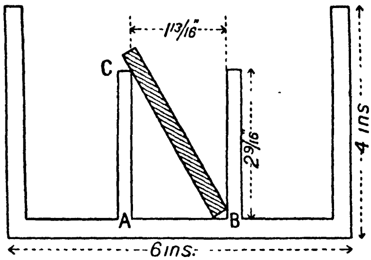

FIG. 35.—Dimension of box for storing lantern slides.

iv. Not only is storage easy, but each picture is easy to find and easy to put away in place again. The subject is written on the top edge of the slide and is always visible. A collection of lantern slides forms its own card catalogue.

v. Though the slides are small, yet the maps, pictures and diagrams are large on the screen and may be seen by the whole class. Even large pictures, framed or unframed, are often rather small for class use. Here the lantern has a great advantage. A 4-foot lantern illustration is small as such things go, but even that size is unknown as a size for a school picture of any other kind.

vi. It is a great deal easier to show a number of pictures with a lantern than it is to exhibit the same number of large unframed pictures. As we have said there is little provision in the ordinary class-room for the exhibition of maps; to exhibit large pictures is usually even more difficult, and the difficulty increases with an increase in number. In the case of the lantern, while it is often advantageous to show only one slide, it is almost equally easy to show a dozen.

vii. By means of the lantern one can procure and show to the class pictures, maps, and diagrams which cannot be obtained and shown in any other way.

viii. In one respect the lantern is superior even to an excursion. One can always point to the particular feature to which attention is to be directed.

ix. Nor is a lantern really expensive. The only expensive part is the lamp, which must be bought; but a very serviceable lantern has been built in the manual training-room of a school; the lenses were obtained from the physics laboratory and fitted into cocoa tins, while the condenser was bought second-hand for a shilling or two.

We have already spoken of the disadvantages of the lantern, but in view of the enormous advantages of its use it is as well to see whether the difficulties cannot be overcome. As a matter of fact they are by no means as great as they appear at first sight.

There is the disadvantage that it takes *time* to get out the lantern and arrange it. The same argument might however be applied to a number of other aids to teaching or business. If a typewriter, or a blackboard, were kept in a dusty cupboard in the basement, and used at rare intervals, it would be equally legitimate to say that it would take trouble to get it out of the cellar and put it in order, and that it really was not worth while. The argument is fallacious because the premises are wrong. We do not suggest that the lantern should be used only occasionally, but that it should be used in many lessons. There need never be any special getting out and putting away.

The most satisfactory thing is to have a special room for geography, with a lantern fixed in place and dark blinds fitted to the windows. When this is the case, with a little organisation the slide may be on the screen within thirty seconds of the decision to use the lantern. Even when there is no special geography room the lantern may be kept in order and ready for use, and may be installed in any room quite quickly. An electric lantern, if the arc is of the physics laboratory type, can be run off any lighting circuit and the light is quite brilliant enough for use in any ordinary class-room. A school which is fitted with electric light can thus have a lantern fixed in a minute or two. There is no need for a special power circuit. A blackboard on a couple of desks supplies a ready-made stand. The light from windows might be considered a difficulty; but in practice, if *work* is going to be done, it is well not to have the room dark. While special dark blinds are to be recommended, ordinary blinds are enough in many cases, and it is only when the sunshine is pouring into the room that the use of the lantern is impossible.

If electric light is not fitted in the school oxyhydrogen may be employed. In this case it may be well to have such an arrangement as that shown in fig. 36. The lantern is kept permanently on a stand and most of the connections are fixed. The oxygen cylinder supplies a heavy weight by which the whole is kept steady. Only the gas tube requires to be connected to a gas bracket. For convenience of transport two "sedan-chair" handles are fitted at the front and the back. The whole stand can then be easily lifted from one room to another.

There are other possibilities both with electric light and with other forms of illuminant, but enough has been said to show that the difficulties of setting up the lantern may be overcome.

The screen has been mentioned as making another difficulty. Of this less need be said. The back of a

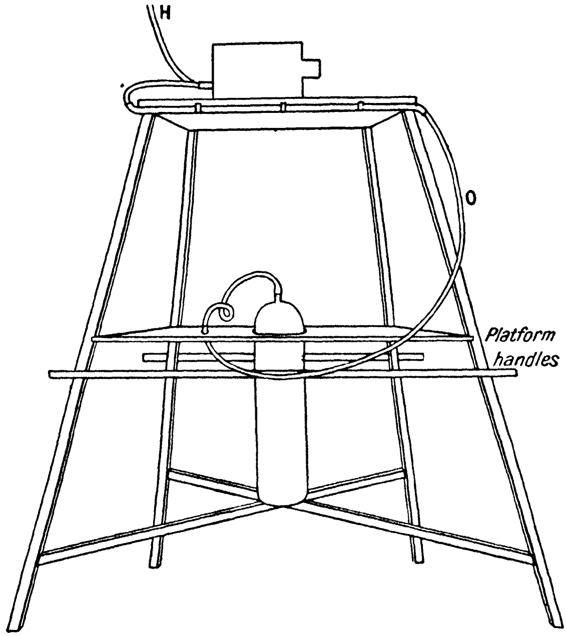

FIG 36 —Portable stand and fittings for oxyhydrogen lantern.

map may serve very well, and even a clear space on a wall is quite effective.

The argument that time is taken up scarcely stands examination. This is indeed not the point, for no one denies that it takes time to use a lantern; what is really suggested and desired to be suggested is not that time is taken, but that more time is taken by the use of the lantern than is saved by it. This is simply not true. Our contention is that the lantern *saves* time. It may do this in two ways. Time is saved in that pictures may be put on the screen *more* quickly than they may be put on the blackboard or elsewhere, that diagrams and tables may be put on the screen *more* quickly than they can be distributed to a class and collected again, and generally that less time is taken in the mechanical details of teaching than in using other appliances. Also, it is claimed that the lantern saves time by making teaching more effective and real, by eliminating possibilities of misunderstanding, as we are able to use means, and use them quickly, that are not otherwise available, and by ensuring that the pupils have a fuller knowledge of the subject.

As to the difficulty of providing suitable slides it is certainly true that there is considerable difficulty in obtaining views suitable for class-teaching. View slides may be obtained in various ways. They may be bought, hired, borrowed, or made from one's own negatives. Whether bought or hired or borrowed, one must take considerable trouble to select the pictures one wants. This is a difficulty of course, but it is a difficulty which must be faced by any teacher who is going to make use of any kind of pictorial illustration. Bought slides are expensive, but it will be found convenient, if not necessary, in schools where the lantern is used regularly to buy some slides, if only to make up deficiencies in other ways. The slides may be hired from dealers or borrowed from various sources. Some education authorities have collections of slides which are sent out free of charge to schools in their area, and the Geographical Association has a collection which may be borrowed by members. The Victoria League hires out slides of the British

Empire. Railway companies and some Dominion Governments also lend slides. When one hires or borrows slides, however, it is usually found that not all that are ordered arrive for the lesson for which they have been arranged. Also the lesson has to be fixed some time ahead, and unforeseen circumstances may prevent the lesson being given. These are disadvantages, but a disadvantage of an educational character may seem to some teachers of even more importance. Slides must be hired or borrowed in considerable numbers. Now, some lessons may be entirely lantern lessons, but as probably the best way to use the lantern is to show a few slides at a time, it is not using the lantern in the best way if slides are hired or borrowed too often. It is thus necessary to have at least a small collection for regular use.

Then one may make slides from one's own negatives or get them made. Slides may be made from one's own negatives at considerably less cost than if they were bought. But it is quite obvious that if we were confined to the use of the pictures we took ourselves, we should have many blanks. With all their disadvantages we are therefore compelled to fall back on the slides which are bought or hired.

In many respects what has been said with regard to the diascope applies to the episcope. As compared with the former the episcope has certain disadvantages:

(1) The instrument requires to have a more powerful source of light and its use is impossible if electric light is not available.

(2) Unless the light source is very powerful the class-room has to be darker than is necessary with the diascope.

(3) The greater amount of light is accompanied by a greater amount of heat which may damage the pictures or objects shown.

(4) The less expensive episcopes give large dull pictures unless they are placed near the screen; in most cases this implies that they are placed awkwardly in the middle of the class-room.

But when all is said and done the episcope does extend very greatly the potentialities of exhibiting pictures. The only kinds of pictures which are available in considerable numbers are small hand pictures and these are unsuitable for class use unless the episcope is used. One great advantage of the episcope is that it reproduces colour just as easily as black and white. While potentially more pictures are available, in fact only those of a particular size, five or six inches square or a little less, are practical. Larger ones are impossible and smaller ones tend to be ineffective, but there still remains a large supply of pictures of approximately the right size to make it abundantly worth while to have an episcope, especially as small objects can also be exhibited.

The collection of such pictures entails some trouble on the part of the teacher and takes time, but it is well worth doing. At first, no doubt, pictures may be used which are not entirely satisfactory, but if one keeps one's eyes open replacements may always be made and eventually very fine teaching sets may be built up and stored as suggested on page 208, though it is not usually necessary or even advisable to mount pictures intended for the episcope on thick cardboard as this increases very greatly the storage space necessary; at most a paper mount is all that is required.

As the lantern, or diascope, and the episcope are supplementary to each other it is well to have the instrument which combines both methods of presentation, the epidiascope. In choosing an epidiascope a number of points should be kept in mind.

(1) There should be plenty of light; it has been pointed out that the episcope requires more light than the diascope to give an equally bright picture; some instruments provide for this by having an extra light which can be switched on for "epi" projection.

(2) There should be as little heat as possible. The heat may be dispersed by a fan or by good ventilation; it may also be reduced by economising light by a good lens system and use of mirrors.

(3) The picture should be small when the projector is at a convenient distance from the screen. As we have pointed out, one of the difficulties in the use of the episcope is that the simpler the lens system the larger and duller the picture at any given distance from the screen, so that the episcope has to be placed near the screen and usually in the middle of the classroom in order to have a small enough picture. It is to be remembered that a small bright picture is better than a large dull one.

(4) If the episcope has a long throw, i.e. if there is a long distance from the episcope to the screen it is specially necessary to have a small picture in order to decrease the heat.

(5) It is desirable to have the "epi" pictures about the same size on the screen as the "dia" pictures.

(6) The mirror which has to be used in order to show "epi" pictures "the right way round" should be protected.

(7) The stage on which .the pictures are placed should come up against a *fixed* glass plate.

(8) There should be some device for inserting "epi" pictures quickly. At present normally more time is spent in changing "epi" pictures than in changing lantern slides.

It is evident that with all its advantages the lantern or epidiascope does not suffer by comparison with other means of illustration; very much the reverse. And it must not be forgotten that the argument for the lantern does not depend on the existence of a supply of views, however adequate. Even if pictures could never be shown in a lantern, it would still be an enormous convenience for other forms of illustration, and, as we shall show, these forms of illustration may be easily and quickly made.

The difficulties involved in using the lantern seem to diminish when they are examined. There still remains the root difficulty that some people do not know how to use the lantern and are consequently afraid of it. As to this there is no more to be said than that a teacher of geography who does not know how to use one of the most useful means of teaching his subject is not really equipped for his job. That can, however, scarcely be a charge against the lantern. Luckily there is little to learn.

CHAPTER XVI

THE USE OF THE EPIDIASCOPE

In the last chapter we have spoken at some length of epi- and diascopes, but there is a good deal more that might be said. We shall in this chapter deal first with the making and use of slides.

Slides may be made by means of photography, and probably when lantern slides are spoken of most people think of those made in this way. They may be made by anyone who develops his or her own negatives, or who prints gas-light papers. Prepared plates are printed and developed in precisely the same way. The film side is then protected by a cover glass of the same size, and the two are bound together by strips of gummed paper. Between the film and the cover there is always inserted a mask of black paper which cuts out those parts of the view which it is undesirable to show. The binding strips of gummed paper are usually black, but may be of any colour. There is, indeed, some advantage in using different colours, as this facilitates classification. Slides can also be made from one's own negatives by professional photographers at from 7d. each upwards, according to the photographer.

The advantage of making slides from one's own negatives is twofold. In the first place one knows what is shown on the slide, one knows the significance of the slide, and one knows the relationship of what is shown on the slide to facts that are not shown; in fact the evil effects of the "frame" may to some extent be removed. Another advantage is that with care the merely pretty slide may be eliminated; it is indeed not necessary to have "pictures" at all. Many geographical facts are not pretty. The geography teacher wishes to have views that bring out the geographic facts whether these are pretty or not. It is extraordinary how many apparently uninteresting views have great geographic value, and how many pretty pictures are of no value at all. The geography teacher can choose his subjects with advantage to himself and others. Indeed, a teacher who goes out with his camera, determined to look for and take geographic views, will incidentally see a great deal that he would not otherwise have noticed, and learn a great deal of geography that he would probably have missed. The geographical photographer has always present to his mind such questions as "What does this view show?" "Does it show that clearly enough?" "Would another view show it better?"

But photography is useful in other ways. Views and diagrams may be copied. The law of copyright in published works must of course be respected, but there are many old prints which are quite useful and to which it does not apply, and when teachers are using illustrations for teaching, and not for profit, many authors will give permission for lantern slides to be made. Also one's own diagrams may be copied. We may draw these on a scale which, though much larger than usual, is yet too small for class use. These may be photographed and reproduced in the ordinary way. It may be noted that such work is best suited for reproduction when it is drawn in indian ink on white paper.

It is however not necessary to use photography at all in making slides; a very great number of useful slides may be made in other ways. Perhaps the most useful is to draw diagrams, maps, statistics, etc., directly on the slide. Most diagrams which are unsuitable for blackboard work, because of the limitations of the latter, are usually quite satisfactory when drawn directly on the slide. Slides may be had prepared for such drawing in various ways. Some are coated with a black substance through which light cannot pass. The diagram is drawn by scratching with a sharp point. This is not very satisfactory; nothing can be traced on such a slide, nor can colour be used. Then there are slides with a fine ground-glass surface; these are specially suited for pencil sketches as very soft effects can be obtained, but from the nature of the case they are not of much service in geographical work. There remain the gelatine-coated slide, practically a photographic plate without any sensitising substance, and the plain slide. Either will take colour. That coated with gelatine takes ink and colour slightly more easily than the plain glass, but is considerably more expensive. Prepared plates are, however, not really necessary. Whatever is desired may be written or drawn directly on the glass if it is absolutely dry. The ink will run if the glass has been recently washed. The most convenient plan, therefore, is to obtain cover-glasses for slides, which are cheaper than prepared slides, wash and polish them carefully, and then leave them for a month or two. They will be ready for use when required. Any ink will do and any pen, but of course a fine pen gives finer lines; also indian ink gives a better black than do writing inks, and can be used quite easily if the pen is wiped after every three or four dips. Red, blue, green inks, and indeed inks of any colour can be used, if necessary.

We may also combine photography and drawing. For example, an orographical map of a particular region may be photographed and a number of glass prints made from the negative. On each of these prints different details may be drawn in colour, roads on one, railways on another, vegetation on a third, and towns on a fourth. It is also convenient on occasion to direct attention on view slides to particular features. This can be done by some mark such as an arrow.

Material for the episcope also may be provided in other ways than by collecting pictures. If they are the right size maps, diagrams, pen and ink sketches, printed material, and in fact almost anything on paper can be shown effectively. A particular good exercise by a pupil may be exhibited to the rest of the class to show what can be done, while the awful example with its red ink corrections can equally well be projected on the screen. In some ways also the episcope may take the place of the blackboard, though the latter retains the great advantage of allowing the class to see something happening on it. For such illustrations as are "not to be rubbed off," however, the episcope is the better.

When we come to consider the use of pictures, the most important fact to be noted is that while the lantern lecture has its place in school, and though as a matter of fact the lantern is more often used in schools to give a lantern lecture than for any other purpose, yet that is not its chief use. It may be said with the utmost confidence that the single picture shown during one lesson period has much more value than a large number. There are few geography lessons which are not the better for some appeal to the eye in a more precise form than is possible with the blackboard, and there are fewer still in which really good work can be done by taking up the whole time with the exhibition of such illustrations. The place for such extensive use of the lantern is in revision.

But when new work is being done one must go slowly, and here the epidiascope is extremely useful. The single picture or diagram may be exhibited for a minute or two in order to make plain but one point in a lesson; more often it may be on the screen for a considerable time. The object is to teach the children what can be seen on the picture or map or diagram. It is perhaps obvious that the implications of a map cannot be seen at once, especially by children, so that when the epidiascope is used to exhibit a complicated orographical map, whether of a large or of a small area, we may expect to have to prolong the exhibition. But while it may not be so obvious it is equally true that many simple views will repay lengthened study and analysis. Boys and girls enjoy the game, all too seldom played, of trying to discover what may be seen on a really good view. Incidentally, a teacher learns what are the characteristics of a really good view, which need not be a striking one. It is wonderful how expert children become in detecting things that matter. In default of a visit to a spot the view shown by lantern or episcope is a good substitute, and for class work is in many ways even better (pp. 212, 216).

Many maps shown by the epidiascope are, of course, really wall-maps, and one of these may be on the screen for a good part of a lesson. There are also maps which may be used again and again in different lessons as well as being used intensively in one lesson. A Bradshaw railway map of England, or, better still, of Scotland, brings out relationships of communication and relief extraordinarily well. If the purpose is merely to give a general impression, and the slide is worth making for that alone, it need not be on the screen for long. But it may be employed for detailed work, when, of course, it must be exhibited for a considerable time. A page of a Bradshaw, showing train and boat connections between Scotland and Ireland, may be used as the basis of practical work, which will make clear to the class the geographical relationship of the two countries—and much else beside.

Single views, too, are of great value whether they show a wide stretch of country or supply material for a more intensive study of a smaller area. A view of a small stream flowing through a narrow valley flanked by bare hillsides looks at first neither interesting nor geographical, but if the road and railway be noticed running alongside the stream, and it is pointed out that the railway is the main line from Carlisle to Glasgow near Beattock summit, all the smaller details of the picture acquire significance and the slide may serve as a text for a lesson on the Southern Uplands.

This suggests what the criterion is by which we may judge the quality of pictures. They must show something definite, and the details as well as the general scheme of the picture should be right. The picture should in fact be definitely *somewhere*. In the absence of the better we must sometimes put up with the worse, but there is no reason why we should not replace the worse by the better when we can do so, and this implies that we know what the better is. Views of similar regions must, of course, be similar; but even so, there are usually some small differences to be noted between similar regions, and where we can afford at best to have only a few pictures it is well to aim at having the characteristic things in their setting. It is the obvious characteristic things that are to appear on our pictures. The exceptions, if they appear at all, should come later in the course rather than earlier. In dry lands, to take a very simple case, the houses normally have flat roofs, though houses with roofs that are not flat do occur. With the younger classes, at least, it is just as well to show only the former.

It is perhaps even more important to avoid the merely spectacular and extraordinary. Pictures of foreign ports with lightly clad figures diving for coins are not untrue, but they are not characteristic and leave a totally wrong impression. They belong to globe-trotters' collections, not to geography. It is the normal everyday things, the commoner the better, with which we are concerned, and in our necessarily small collections of slides we have room only for the typical. We may very well leave the universities to deal with the extraordinary. In all this we are in fact merely insisting in terms of epidiascope views on the fundamental principle that it is regional geography which we should teach.

Views, then, are normally used in connection with definite regional work, but they may also be used for map exercises. Attempts to draw a map of the country seen on a suitable picture are bound to make clear the connection between the map and the country it represents. The limitations of both the map and the picture are brought out very forcibly. Contour work acquires a reality almost equal to that done on the ground, and is accomplished with a great deal more ease. If two views are shown of the same area from different points of view, the accuracy of the work will, of course, be greatly increased. View slides may occasionally be found which include, as an inset or otherwise, a map of the district shown in the view. Such an arrangement is usually difficult to come by, but the relationship between map and view may be made more evident if we have a reproduction of a large scale map of the district shown on the view, and the pupils are asked to identify corresponding points on the map and the view. It may be noted that mountainous districts supply easier examples with which to begin such work than do flat lands.

Much work in connection with contour maps is barren or of very little use, just because the map conjures up no corresponding impression of the place for which the map stands. Even questions in public examinations are open to the same criticism. The children may know that a series of V-shaped contour lines numbered in a particular way represents a valley, while if they are numbered in a different way the series represents a spur. They may know that the slope is gentle where the lines are far apart, and steep where they are close together; they may know that railways follow valleys and climb where the slope is least, but this may be very valueless knowledge. These may be merely working rules like the rules by which they find square root. The pupils may get the answer correctly, but it will convey to them no suggestion of the reality. It is essential that we associate land-forms, as shown by means of contour lines, either with the reality on the ground, if possible, or, if that is not possible, with the same facts shown on pictures. Separate maps and pictures may be supplied to each member of the class, and this method has its advantages, but in many cases this cannot be done; here is the opportunity to show the map and the picture by means of the lantern or episcope. If the study of land-forms is to mean anything more than working with useless square-root rules, land-form work must be done in one or other, and preferably in both, of these two ways.

In the cases mentioned in the last two paragraphs we have spoken not of single views but of related views. The lantern lecture is usually unsatisfactory, not only because too much is attempted at once, but because the relationship between the separate views is often non-existent, thus breaking a fundamental rule of all good teaching. When two or more views are exhibited together, the relationship between them should normally be very definite and clear.

This is obviously so in the cases considered. Sometimes with very young children it is useful to exhibit views of a country which, apart from the title "Greece" or "Egypt," apparently have little connection with each other. These, however, should be treated in the same way as stereoscopic views (p. 211) are treated, and the exception is only apparent. They are in fact definitely made to hang together; if they do not do so they should be discarded.

Such series of views as can be exhibited together really show the same fact or the same facts from different aspects. A series may also consist of maps showing the same area on larger and larger and larger scales, or of orographical maps which emphasise the different relationships of the facts by the colouring of heights differently. Or the series may consist of views showing the same area from different standpoints. Views may be taken from a distance, and then successively nearer and nearer. The thing itself is shown and its setting is shown. Sometimes a distant and a near view are all that is required, but often an intermediate view is necessary, and sometimes more than one. To some extent this eliminates "the frame" as far as the principal subject of the view is concerned. When views show the same thing from different directions, "the frame" becomes of comparatively little account, though the thinking is harder which is necessary to combine all the views into one idea. It is, however, an excellent training in "thinking solid," without which geography is a sham, and it helps to leaven the two dimensional geography which is no geography at all. Nor must it be forgotten that geography is concerned with time. The same view from the same place at different times is often extremely instructive, whether it be of a river valley to show the stream at high and low water, or of the seashore to show the variation in the height of the tide, or of some happening in connection with human geography to show different stages in the growth of crops or a city.

Here we are dealing with matters which might seem to be best shown by the kinema. But the function of the kinematograph film is quite different from that of the lantern slide or epidiascope picture. It has sometimes been said that the kinema will replace the lantern. This is to misunderstand the possibilities of both. The kinema is supreme in the exhibition of movement, and of fairly quick movement, such as takes place in industrial processes or such argicultural processes as ploughing and reaping. Where the emphasis is on the movement, or on a movement as a whole, then the kinematograph is the more useful instrument. But the lantern remains supreme where movement is not to be specially emphasised, or where analysis rather than synthesis is desired. In the case of a cultivated field the emphasis may be on the appearance of the field at different times, when it is ploughed, when it is being sown, when the crop is coming up, when the grain is in the ear and when it is being reaped. Here though we recognise that each is a stage in the general process of becoming, and though a film might be made to show the continuous movement from one stage to the next and then run off quickly, yet the picture would be the more educative, just because it presents an analysis of the process. One thing is taken at a time. So long as the emphasis is on this analysis, and it does not matter whether two slides or one hundred and fifty are exhibited in an hour, the lantern must be used. Normally, in school, one new thing at a time is enough; hence the value of the single picture.

Another matter pertaining to the use of the epidiascope remains to be considered. When it is used for public lectures the audience sits facing the screen; the operator with the lantern or episcope is at the back of the room and the lecturer stands by the screen. In the class-room this arrangement is impossible, for the "lecturer" must perforce be the operator unless he has trained a pupil to act as operator. He cannot stand by the screen, he must be by the instrument. If the latter remains at the back of the room, the teacher is compelled to address the class from behind. This is, of course, not impossible in such a small room as a class-room always is, and if only lectures had to be considered it might be the most satisfactory way. But the fact that we are considering the epidiascope as an aid to teaching rather than to lecturing makes a great difference. We have pointed out that the important thing in teaching, as distinct from lecturing, is to be able to introduce the single view or diagram just when it is wanted. This makes the back of the room rather an inconvenient place for the epi- or diascope lantern. It is vastly more satisfactory to have it placed conveniently to the teacher's hand.

Obviously the screen must be in a position to be seen by the class. In fact the class, the teacher, and the screen must all "look at" each other. Some kind of triangular arrangement of the three is advisable. The point is further developed in the Appendix, but here it is sufficient to say that the problem seems to be solved by placing the screen across one corner of the room, preferably the corner at the right hand of the class, with the projector on the opposite side. At the worst the screen may be the back of a map on an easel and the lantern be placed on a blackboard laid on a desk. At the best one will have a spring screen fixed to the ceiling in such a way that it can be drawn down like a roller blind. The projector will then be permanently in place, in close proximity to a cabinet of lantern slides and files of material for the episcope carefully arranged so that they may easily selected. With projector and material conveniently placed, and there is no reason why they should be inconveniently placed, the use of the epidiascope certainly saves time in teaching geography. The single view may be put on the screen in a few seconds, and if more views than one are to be used they can quite as easily be selected and shown.

When the projector is constantly used for teaching and learning, as distinct from lecturing and looking, the picture becomes of enormous value in bridging over the gap between the class-room and the world. The children observe pictures with critical eyes, they learn to look for things, to see through things and behind things. The epidiascope and film projector, of which we shall speak in the next chapter, help as nothing else does towards our aim of getting these young people to imagine the real things in the world and see them whole in their world setting.

CHAPTER XVII

THE FILM IN THE CLASS-ROOM

We have already referred to films and film projectors as being useful, and if we have left these to be considered last of the material aids it is not because they are of least account. It has been abundantly proved that by the use of films there is not only an increased knowledge of fact but that the film enhances the richness, accuracy and meaning of personal experiences and gives increased interest to school work. Especially will this be the case when coloured films, lately made practicable, are still further developed and become common. The world is colourful and it is quite obvious that the monochrome world to which most pictures accustom us is not a real one.

Any picture of a subject is immensely better than any description of the subject in print or by word of mouth, for by any method of verbal description an immense number of little but vital details are missed out, and a film is in many cases very much the best kind of picture. The remark of the child after seeing a film, "I know now what the teacher means," crystallises the argument for pictures, still or moving, in the class-room as a basis for teaching. If the children do not know what the teacher means, and without the film this is often the case, there is not much use in the teacher teaching.

If, however, we are to use films satisfactorily we must in the first place realise for what qualities they are useful and especially in what ways and in what circumstances they are superior to still pictures shown in the epi- or diascope. The essential and obvious difference between the instruments is that the film projector can show movements; an incidental difference, though it is not so important in the class-room, is that some types of projectors can supply sound accompaniments either in the form of words or natural sounds.

It is this possibility of showing movement that makes films so valuable. Life consists of movement, and the introduction of movement makes the presentation of anything to do with life much more real. If geography is to deal with realities it is obvious that the introduction of movement is necessary if we are to give the children any true conception of the things with which geography deals.

But as geography deals with the stage on which man plays his part rather than with the actions on that stage, it is also obvious that the film has not quite the same place in geography teaching as it might have in, say, nature study or history, in which movement is much more prominent. It is true that to some extent the stage is a moving stage; not only are there natural movements such as those of wind or water, but part of the setting of the stage for any person or group of persons consists in the other actors and their actions in the more or less immediate neighbourhood. The various peoples of the world are essential parts of the setting of the world stage for the inhabitants of Britain. Nevertheless it still remains that a very great part of the setting of any one part of the stage is static or moves so slowly that the movement is not visible. Clouds may move across the sky and the sun may change his place every instant, but not at rates which are usually noticeable on a film. In fact, the geography shown on a film is fundamentally a background to actions rather than the actions themselves.

With this in mind we can understand something of the function and method of use of the film. We have already pointed out that when we wish to exhibit the appearance of things, and especially the appearance at a particular time undisturbed by passing happenings and when analysis is our aim, the still picture is the more useful. When, however, we wish to show these happenings in their setting, and especially if we wish to show how the setting conditions the happenings, then the film is the more satisfactory medium.

There is another case when the film may sometimes be better than the still picture, i.e. if the camera itself is moving at the time that the picture is taken. When the camera is moving forward or backward or "panoraming" round we obtain much the same result as when we show two or three slides of the same object from different directions or distances. In both cases the effect is to eliminate the frame. In some cases the slides may be more effective, in others the film. If the directions from which the views are taken are very different or the distances great, the practical difficulty remains of moving the film camera quickly enough from one position to the other, and the lantern slide supplies the only practicable method of obtaining the effect we desire.

To sum up, it may be said that wherever movement is essential for the understanding of the reality the film is almost always the more useful.

When we come to consider ways in which films may be shown it must be remembered that we are here considering only the use of films in school. Of course films are useful outside the class-room, educationally as well as for entertainment in public theatres either in the ordinary programmes or in mass demonstrations to children, but with such exhibitions we are not here concerned. In school they may be shown either in particular class-rooms to a single class or in the school hall to several classes or to the whole school. The difference makes difference of use possible and even imperative. In the school hall, as in any case where there is mass presentation, the films to be shown must be complete in themselves; they may teach, but anything that has to be explained has to be explained clearly by sound or caption. Any maps and diagrams that are necessary to make the situation clear must appear in the film; if it is referred to more than once the map must appear more than once. As in all good teaching, these films must be simple and nothing must be taken for granted. When seen in this way reference may of course be made to them in class-rooms later.

In the school hall the children may have experiences and gain information; they may be instructed, they may practice concentration, but they cannot speak; there can be little of normal individual work and there can be no teaching in the narrower sense. The films shown must be such as suit a number of classes. In the class-room the possibilities are much greater. There can be more attention to particular needs; a film shown may suit just that particular class at that particular time; it may fit into its place in the syllabus; the methods of use may be more varied.

A film may be shown and a lesson given afterwards based on it, or a lesson may be given and the film shown afterwards. Of the two, and if there is no other possible procedure, it is probable that in most cases it is better to give the lesson after the film is shown, as in that case the children "know what the teacher means." Experiment appears to confirm this. Dr Consitt showed history films to pairs of classes, one of which saw the film first while the other had the lesson first. In 32 cases the group which had the film first scored more highly, and in 15 cases the group which had the lesson first had the higher marks. These tests were given immediately after the lessons. In the tests given several weeks later, 15 groups which had the film first scored most highly and 8 groups which had the lesson first scored the higher marks.

Further, in the Middlesex experiment in 8 schools (40 films) the children did better when the film was followed by a lesson than vice versa, and in only one school (10 films) did the children do better who had the lesson first. Weber in his Arkansas experiment found also that a film followed by a lesson was better than a lesson followed by a film.

Other methods are, however, possible in the class-room. The film can be worked into the body of the lesson as is other material of which lessons are built up. It may, for example, be shown in short sections. It is to be remembered that we are dealing with the stage and not the drama. In a history film, in which the action is the chief thing, it may very well be necessary to show longer sections or even a complete film at once, though Dr Consitt points out that even in a history film when details of dress or buildings require notice it is necessary to stop the film to draw attention to these. Still more is it necessary to stop a geography film in which a considerable part of the setting of the stage, as we have pointed out, is the background to action rather than the action itself.

There is, too, another reason for taking a geography film in short sections, a reason which does not apply to history films. The action of a drama, because action is a simple affair, may be clearly followed for hours rather than minutes, but there is generally far too much in geography films of, say, 15 minutes, if they are of any geographical value at all, to be assimilated by the children in 15 minutes by merely looking at them. It is not merely advantageous but necessary to break them up.

Nor is this all. It is an accepted principle of teaching that unless the pupil is doing something he or she is not learning. It is not suggested that he is not learning when he is looking at a good film for 15 minutes or even longer. There are even good geography films in which one simple idea is being presented and being built up in the minds of the children by a multitude of small details which are remembered because they contribute to the idea. But normally the kinds of things of which he learns in this way have to do with action rather than with the background of action. If he is to analyse, to synthesise or study the stage and not merely look at it cursorily the film has to be stopped repeatedly.

It is to be noted also that either before or after the film is shown section by section in the course of a lesson it is usually necessary to show it through as a whole without stopping. It is well to do so not only because the class sees the main idea in this way, if there is a main idea, but because twice showing, as in so much of teaching, is very much more than double "once" in value. All this implies that the class-room geography film should be short, something of the order of seven or eight minutes, and if it is shorter so much the better. Such a film, together with normal work of map and textbook, is abundantly enough for an ordinary lesson period.

It may be noted here that such films need not be complete in themselves. It is the lesson of which the film forms a part that should be complete. In normal circumstances there need not be any maps or diagrams in such films as have to be in those shown in the school hall if these can be supplied in other ways; an exception should be made, however, in the case of a film in which the location of the setting is not likely to be marked on a school atlas. There need not even be any captions; if the teacher knows the film thoroughly, as he ought to do, the film becomes something to be worked with, not merely a means of instruction.

We must now consider how it is possible to show films in the class-room in this way. Much depends on the projector and the size of the film. Projectors are made to take five sizes of films: 35 mm., 17·5 mm., 16 mm., 9·5 mm., and 8 mm. The 35 mm. projectors are mainly of use in public theatres and may be also the proper projectors for school halls. They are powerful machines, but as so many 35 mm. films are printed on inflammable stock it is necessary to have a fireproof projection room. For most educational purposes the substandard machines, as all the others are called, are the most suitable. Of these the 9·5 and 8 mm. are on the whole too small for use with large classes. Also, though the 9·5 mm. films were the first substandard films to be used educationally in this country, the supply has not been greatly increased, while there are fewer still for the 17·5 and 8 mm. projectors. In fact, the 16 mm. projector has become the substandard "standard" for educational purposes. Projectors taking this size of film can be obtained which can show pictures to audiences of several hundreds, and there are others suitable for class-room use. For these, as for all substandard projectors, all films are made on safety stock which, if exposed to strong heat, may char but do not flare up. All, however, require the use of electric light; one cannot, as with the lantern, use other forms of illuminant. Normally a projector can be run by connecting the flex with a lighting point if provision has not been made for a small plug.

There are several kinds of 16 mm. projectors which may be used in different circumstances, and here the points which we have discussed are of importance while some others must also be considered. Some projectors have sound accompaniments and some can show only silent films. Obviously in the school hall it is well to have a sound projector. A 35 mm. projector will certainly have provision for sound, and there are 16 mm. projectors which also provide sound. In geography class-rooms other conditions apply: here the pupils do not merely look and listen, they must be as active as possible; in particular they should have as much opportunity as possible for expressing themselves.

Even as it is each pupil has not much chance for this, and if all are to remain silent while a sound film is shown opportunities for such expression are still further diminished just when a stimulus to such expression is being given. This consideration would suggest that in the class-room silent films are better than sound films.

This conclusion is strengthened when we take some practical considerations into account. We have said that it appears well to stop films partly in order to divide up what is seen into suitable lengths and partly in order to give time for study of the geographical background, which is too fleeting for study when the film is moving. It may also be well to stop at a caption in order that the teacher may make sure it is better understood than is possible with an even more fleeting voice. Now, if the film stops, heat as well as light is concentrated on a particular frame, as an individual picture is called, and in most projectors this heat is strong enough to char and destroy the picture. This suggests that the heat generated by the lamp in a projector used for showing films that have to be stopped should be small enough to prevent damage; this implies, further, that the light should be just as great as is possible without generating damaging heat. Some projectors attempt to overcome the difficulty by reducing the light when the picture is still, but this is not a very satisfactory solution since as a matter of fact less light is required to show movement than to show a corresponding "still." Others, either in addition or as the only device, use a fan for cooling. This has the disadvantage that even when the film is still and just at the time when either the teacher or the children are speaking there is some buzzing from the fan as well as from the motor. In any case, nearly all projectors giving sound accompaniment produce a rather damaging amount of heat, and in addition the existence of that sound accompaniment makes the problem of stopping a rather difficult one.

Another perhaps even more important consideration also applies. It is quite obvious that in the class-room, as distinct from the school hall, the teacher must not only "give" the lesson but must manage the projector himself as he deals with blackboard, wall-maps and his other material aids. It is equally obvious that the projector must be such that it does not in any way distract his attention from the management of the class and the sequence of the lesson. The projector must be not only foolproof but as simple as possible, just because he has not time to be bothered with anything but the simplest. Teachers with a mechanical turn of mind may find it possible to use more complicated machines, but the ordinary person will use one that requires the minimum of attention.

The last consideration would appear in the majority of cases to rule out not only sound projectors but all but the very simplest silent ones. If the author's experience is any guide, it would seem indeed that a hand-turned projector is preferable in the geography class-room to one that is motor driven. With such a machine there is the minimum of distraction from one's job of teaching; the handle is the one moveable part, and when there is need to stop one just ceases to turn that handle, which is much easier than to stop the motor. Further, there is no need for a speed regulator to which attention must be given; the speed is regulated by turning the handle faster or slower as occasion demands, and this is quite automatic, one does so without thinking.

We can now consider the ways in which most effective use may be made of the film in the class-room. For a number of years experiments were carried on with a view to proving that films *were* useful in teaching. That contention is now accepted, and teachers are now settling down to discover how to use geography films by using them, but actually at present we do not know much about it. A little, however, may be said.

In the first place, as has been suggested earlier, there are cases when it is better to use other means of illustration. If the matter in hand is static, as is so much physical geography, the film is not the best medium. Land forms, for example, can better be dealt with by lantern or episcope. It is still less necessary, even when movement is involved, to show films of places or things which can be seen by the pupils themselves; a visit to a stream is of much more value than a film of a stream.

Then it can safely be said that the fewer lessons entirely given up to study of films the better. Such lessons now and again may be in place, but the practice of having an occasional lantern lesson which takes up the whole period is normally not so useful as that in which a few slides are used in each lesson. In the same way it is pretty certain that the normal maxim for the film in the class-room should be "little and often."

Another condition for success is that the teacher should know thoroughly the film he is using. It is part of the ordinary routine of class teaching for a teacher to know the material he handles. If the first acquaintance which he makes with the textbook is when he sees it in class, one suspects the value of his lessons. Nor would any science master ever dream of going into a laboratory or class-room to use a piece of apparatus which he had not tested, let alone never seen before. Especially when a film without captions is to be shown is it necessary for the teacher to study the film carefully before it is presented to the pupils. Even when notes on a film are provided these cannot be used "raw" but must be adapted to a particular class, and this implies not only considerable study of the notes and the film but of ways of relating them.

Coming to the films themselves, it will be found that a good number of those provided for the teacher of geography deal only with the borderland of his subject, rather than with the subject itself. The value of such films varies greatly. Ploughing, reaping, fishing, spinning and weaving are not in themselves geography, but we cannot understand much of geography if we have not some idea of the connotation of these terms, and the film is very useful for giving that connotation, if indeed it is not absolutely necessary. On the other hand, one may easily have too many films which show manufacturing processes in which boxes, cases, tins, sacks or other containers chase each other round or along endless bands, while the sight of products being loaded on, or unloaded from, vessels is almost as common in so-called educational films as are lovers' embraces on entertainment films and much less entertaining or even educational.

Even when there is a definite geographical background to the movement shown, some films are of more value for teaching purposes than are others. The story of a film may be laid in a certain geographical environment but have nothing to do with that environment. To the extent that it shows the environment it is useful, but a more useful type of film is that in which the action is conditioned by the environment, as when a man is shown to be in dire distress in a desert for lack of water. In such a case there is little need for actual teaching on the main point of the film, which itself drives home the important fact. Such films are fundamentally regional and fit into our schemes of regional teaching.

Whatever the subject, it is essential that films used in the class-room should be clear and simple. The dictum of the schoolgirl about textbooks, "We haven't time to think what the author may mean," is even more applicable to films; quick pseudo-artistic shots of bits of machinery in motion which may suit the adult mind are entirely unsuitable in a class-room. They do not let the children know what the teacher means, but are merely confusing.

As for methods of using films, the most important thing that can be said is that there is certainly no stereotyped method, but it is equally certain that all satisfactory methods will be in accord with ordinary class-room teaching practice. Observations have to be made, and films help enormously in providing material which has been sadly lacking in the past for the making of direct geographical observations; attention has to be directed to matters that have to be remembered in such a way that they *are* remembered; problems have to be set and solved; questions have to be asked, not always by the teacher, and answered; particular ideas presented to the children for their consideration; and generally the children have to be educated rather than instructed. They should *not* be given the film to learn as a generation ago they were given a book to learn. Something will inevitably be learned, but it is of more importance that the material presented should be worked with and metaphorically chewed up, digested and assimilated as it is in all good teaching.

CHAPTER XVIII

HOME GEOGRAPHY

The home region is worth studying for its own sake. We should surely understand the facts which immediately condition our own lives. Of this study we shall speak later. We shall first consider the other reason for studying the home region, that it is only by such study that we can understand the rest of the world. It supplies practically the only means by which the rest of the world can be realised and measured.

This study of the homeland and of the neighbourhood is fundamental. To most children it supplies the only criterion by which the rest of the world may be judged ; the standards which are known to the children themselves are the only ones which may be used to measure other places. One distrusts an internationalist who is not also a nationalist ; one distrusts a nationalist who does not also take an interest in local affairs ; one distrusts the young woman who has a mission in the world, but who leaves mother to wash up the dishes. It is easy enough to sympathise with the inhabitants of Asia Minor ; it is much more difficult to sympathise with the lady next door who throws rubbish into our back yard, or with the neighbour whose dog or cat *will* break down our favourite flowers. So the geography which is to be real, scientific, or humane must be continually based on what is known by experience.

We have already pointed out that geography, like charity, begins at home, but does not end there, and indeed the first year's course is largely based on the home region. There is, however, more to be done with the home region than is there outlined.

Let us consider the simplest idea of measurement. In order that we may understand the size and extent of different parts of the world, we must have something by which to measure. We have already seen how qualitative measurement may be done in the first year's course. Later, the home region supplies means for quantitative measurement. The length of a mile or two miles or twenty miles is realised because a particular mile or two miles or twenty miles is known in the home region. The meaning of maps of other lands is realised more accurately when accurate maps have been made of a special area; this area is, of course, normally part of the home region. The meaning of such maps, dealing as they do with the relations of points, is really within the province of the mathematicians, since the work is essentially earth measurement; but it often happens that if such work is to be done at all the geographer must do it.

Usually we learn that there are numbers of ways of fixing points. We hear of triangulation, of offsets from a line and of traverses as if they were entirely different in principle from each other. Generally the triangulation is taken to mean triangulation from a single base line, which is the only distance actually measured. The facts are, however, that—

1. All maps are based on some system of networks.

2. The networks based on latitude and longitude are the *least* accurate networks for small areas. It would be impossible to fix the relations of points in a small area with any accuracy by means of latitude and longitude; one could not find the length of a street by finding the latitude and longitude of its two ends.

3. All other methods by which networks are constructed [1] are based on triangles. Triangulation from a single base line utilises triangles in which one side and two angles are known, traverses use triangles fixed by two sides and the included angle, and offsets use triangles in which two sides are known and the angle between them is a right angle.

4. Actual measurement of the lengths of the sides of triangles is very much more accurate for short distances than are any methods by which angles have to be measured.

We must use the home region to make this matter of networks understood. If an accurate map (or plan) of the class-room is to be made, we shall pretty certainly go about the business by actually measuring two sides and a diagonal, and then the other two sides. We shall not assume that the room is rectangular, because it may not be so, and also because we should be violating the principle that triangulation of small areas gives most accurate results when only distances are measured.

If a playground, or even such a larger area as a football field, is to be mapped, the same principles prevail. For some years the plane table was rather favoured for making maps of such areas. This instrument was used

[1] Grids such as those referred to on p. 185 are not used in the construction of maps but in the reading of them.

partly because it was actually employed in real mapping and partly because it utilised the one-side-and-two-angles method, which was supposed to be the only real triangulation. Now less work is done with the plane table. Maps of playgrounds and even of football fields made by its means tend to be obviously inaccurate, and it is probably for this reason that the use of the instrument is being given up. It is a very practical objection. But there is another and a more fundamental reason why the plane table should not be used for the construction of such a map. The real function of the plane table is to make maps on the scale of an inch to a mile or a quarter of an inch to a mile. One may excuse inaccurate maps of the playground to a class, on the plea that the instrument is not really meant for this kind of work. But practice is better than precept, and if the plane table is the wrong instrument it had better not be used. The use of the wrong instrument is morally wrong as suggesting that wrong methods may be used if one pleases. It is a case of doing evil that good may come of it, and that is at best a dangerous doctrine.

The desirable instrument is the chain, the 50-foot chain marked in feet, not the surveyor's chain marked in links. We are concerned with geography rather than with surveying. The use of the links means that there is something fresh to learn, and suggests or intensifies the idea that the work is difficult. This chain is or should be the standby of accurate school work. It is an instrument actually used; a map of a playground made by its means *looks* accurate and, if ordinary care be taken, stands the test of check measurement.

Where classes are large, and where it is impossible to provide enough chains for the necessary number of working groups, a quite satisfactory makeshift is supplied by a ball of twine and some footrules. A length of twine some 4 or 5 yards long may be served out to each group of boys, who can then by means of a footrule mark off yards on it in any convenient way; a blob of ink will serve for the mark unless much use is to be made of the twine. Distances may then be measured in yards, and the fractions of a yard measured by a footrule. Maps of small areas made in this way compare very favourably with those made by a chain, and are very much more accurate than those made by means of a plane table.

An instrument sometimes used for mapping a playground is a theodolite, but the objections urged against the plane table apply with equal or greater force to the theodolite. The more elaborate the instrument, the more inaccurate are the maps made. The use of some instrument to measure angles does, however, become necessary when we try to map areas where there are obstructions in the way of direct measurement. Then, *as a makeshift*, we have to use triangles in which two sides and the included angle are measured.

In this country it is usually difficult to supply any adequate reason for making maps which require the use of triangles involving angular measurement. Ordnance maps of the area probably exist, and if they do exist they will pretty certainly be better than any that can be made in school. On the outskirts of a town it may, however, be possible to find new roads that have been constructed since the current edition of the Ordnance Survey map was issued, and if the Ordnance map is to be corrected by the insertion of these roads it will almost certainly be impossible to do the work by the measurement of distances only, and some form of traversing will be necessary. For such work angles are not only legitimate but necessary, and either a very simple theodolite or a prismatic compass may be used. If satisfactory results are to be obtained, however, it will be well to reserve the work for those who have had some experience. Mapping of this kind is in accord with another principle of cartography, that one should proceed from the whole to the part, that lesser networks should be fitted into greater networks, that details should be fitted into a general scheme. Maps that are made in school should utilise every scrap of information given in Ordnance maps. By this means the home region is really seen in its geographical setting.

The same principle of placing the home region in its setting is applied in other ways. One can relate not merely the mathematical positions of points in the home region to those outside. One can deal with the relations of other kinds of facts. Surveying, even mathematical surveying, includes the mapping of land-forms, *i.e.* we are concerned with three dimensions rather than with two. Simple accurate work can again be done in the home region to supply data by which to realise the relief of the rest of the world.

Again, too, we should use the simplest instrument which will give results accurate enough to be fitted into the general scheme of things. We shall in the course of the work require to run lines of levels, but the instrument used need not be such that by its aid a line of levels could be run across India and come out with an error of 0·607 of a foot, as has been done. Such an instrument would not be the best that could be used, for the best has to be suited not only to the work in hand, but to the people who use it.

Clinometers which are simple enough to be used by boys and girls of school age give quite good results, but

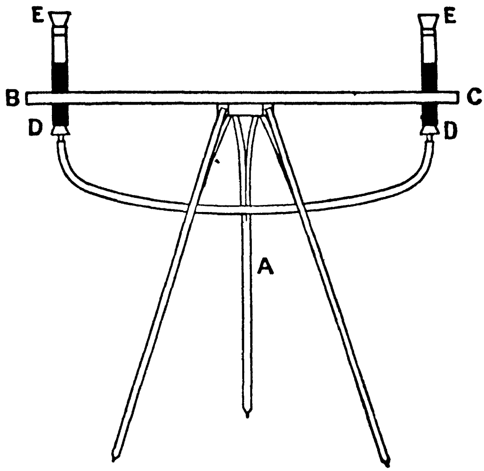

FIG. 37.—Water-level.

an instrument which is to be preferred is the water-level. It is to be preferred because work with it is more like real surveying, because the results are more accurate, and because these results are obtained more simply. The clinometer introduces angles which have to be translated into heights, whereas the level measures heights directly.

The level consists of

(1) A tripod, A, which may be an old camera stand; to this is attached by a bolt and fly-nut

(2) A piece of wood, BC, 30 inches by 3 inches by 1 inch, with two circular holes, one at each end, to receive

(3) The essential part of the instrument, two glass tubes, DE, 1 inch in diameter, connected by an india-rubber tube. The connections at DD are rubber stoppers, bored to receive small glass tubes, on which the rubber tube is slipped.

EE are two rubber stoppers, bored to receive small glass tubes bent at right angles; these allow of free communication with the air, and yet if turned in the direction opposite to that from which the wind is blowing, prevent sudden gusts affecting the level of liquid in the large tubes. If it is necessary to make certain that wind shall have no effect, these tubes can be connected by a rubber one.

Water, coloured by ink, is poured into DE and finds its level in both of these tubes. Methylated spirit will give a flatter meniscus, but it is not really necessary. If one stands some little distance from the level, so that one of the tubes is behind the other, and then lowers the eye till the surface of the farther liquid is in line with that of the nearer, then the eye is at exactly the same height as either surface. So also is any point seen behind the farther surface. By using this fact, levels of different points may be found. The advantages of the instrument are that it requires no adjustment of any kind, and that the principle on which it is worked is so obvious that pupils are not distracted from the work in hand by the necessity of learning something else before they proceed. The errors of the instrument for such work as is possible in schools are probably less than the accidental errors unavoidably introduced in the course of the work.

With this instrument the relief of any area can be found, and contour lines plotted. There is no necessity to go far afield. Very few areas are absolutely flat; even a roof playground in a city can be contoured, and the work is quite worth doing; there are always gullies by which the water runs off, and the rest of the surface slopes down to these. The differences in height are of course not great, but by the aid of the water-level, contour lines with a vertical interval of 1 inch can be drawn quite satisfactorily. A gully may be taken as a base level, and the positions of points may be found which differ from it in height by 1 inch, 2 inches, 3 inches, etc. Nor must it be thought that in such work we are making mountains out of molehills, for even a roof playground gives a very fair representation *to scale* of the surface of the earth. Indeed, if there is a difference the slopes on a roof playground are on the whole greater than those in nature.

The chief disadvantage of contouring a roof playground is that it does not fit into any larger scheme. This defect can be avoided if the area chosen to be mapped be one in the neighbourhood of the school. Then lines of levels may be run along the surrounding streets. Somewhere or other a bench-mark will be found by which the school survey can be connected with the survey of the country. In this case the streets themselves provide the necessary network, and the heights found on the ground may be fixed and plotted in their correct places on a 25-inch Ordnance Survey map. In practice it will be advisable not to take the whole class out at once, as it may cause a little disturbance in a busy street. But a great deal may be done by groups of boys in the midday break and on odd half-days. Dividing up the work in this way has definite advantages; each group of boys identifies on the map the point or points which *they* fixed, and the final result is felt to be a co-operative effort, and all the better for that.

In practice, if the object is to insert contour lines on a given map at, say, 5-foot intervals, it is well to find the positions of points which are exact multiples of 5 feet above sea-level. This can be done either by finding series of points first all of one height, then all of another, then all of a third height, and so on, or by running lines of levels along convenient and easily identified lines on a map. Without being dogmatic on the point, the author is inclined to think that, normally, better results are obtained by running lines of levels.

If this is to be done, the first thing is to find a spot which is a multiple of 5 feet above sea-level. A bench-mark is found. It will be marked on the Ordnance map, and at the spot on the ground indicated on the map will be found on some building a mark as in fig. 38. For the sake of example, we shall say that the horizontal line is given as 154 feet above sea-level. The height of this mark above ground-level is measured. Suppose it is 2 feet 5 inches. Then the height of the ground immediately below the bench-mark is 151 feet 7 inches. We desire to find a point which is 150 feet above sea-level. The instrument is placed some little distance

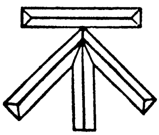

FIG. 38.—Bench-mark.

away. The measuring staff (fig. 39), marked off in feet and inches, is placed on the spot whose height is 151 feet 7 inches. It will probably be found to be well to fit on the staff a sliding square frame, half of which is black and half of which is white, the division being horizontal. This makes an excellent "line" on which to sight. This frame will be slid up and down on the staff till the sighting line is exactly level with the two liquid surfaces in the tubes, as determined by an eye placed a yard or so away from the nearer one. Now the frame is raised 1 foot 7 inches and fixed at that height. The staff is then moved about on likely spots downhill from that whose height is known (151 feet 7 inches); the bar BC of the level is turned, if necessary, but the tripod remains fixed. Finally, a point is found for the staff such that the "line" on the frame is again sighted. The spot thus found is obviously 150 feet above sea-level (fig. 40). Its position is fixed by chaining its distances from some fixed points easily identified on the map.

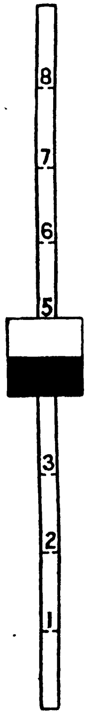

FIG 39 — Measuring staff the frame is a foot square.

Now we can proceed to find a point 145 feet above sea-level. The instrument is moved downhill, the staff being kept fixed. The frame is then lowered till the line is sighted; it is then raised exactly 5 feet, and, the level remaining unmoved, the measuring staff is carried downhill till a point is found at which the line is again sighted. This point must be 145 feet above sea-level. Again its position is fixed by chaining.

Proceeding in this way points of 150 feet, 145 feet, 140 feet, 135 feet, etc., may be found. Of course the line of levels may be run uphill, or the line selected may be undulating, but this makes no difference in principle, nor is there any difficulty in practice.

When a number of lines of levels have been run the contour lines can easily be drawn on the map by joining points of the same height (fig. 41). With a sufficient number of points the relief of the neighbourhood is to be seen and realised in a way that is impossible otherwise. Such work as this supplies the real introduction to contour lines (see p. 155) and to much more than contour lines; the understanding of what slopes of 1 in 10 or 1 in 100 really mean, valuable as it is, comprises only a small part of its value. The important fact is that by such work the home region is again related to the rest of the country. The bench-mark forms the connecting link. We have the answer to the question, "How do we know the height of the bench-mark?" The answer is, "The bench-mark is part of a greater scheme; it has been

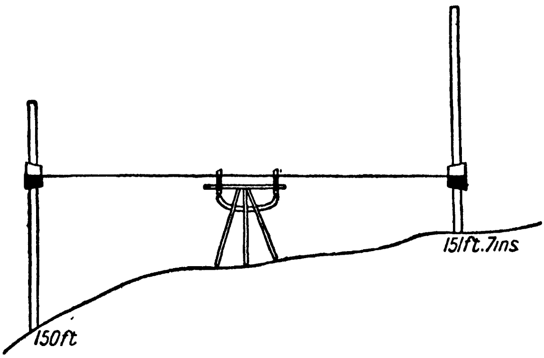

FIG. 40.—The water-level in use.

found in precisely the same way as we found the height of the other points by using the bench-mark." It has taken us a long time to fix even a few points. It

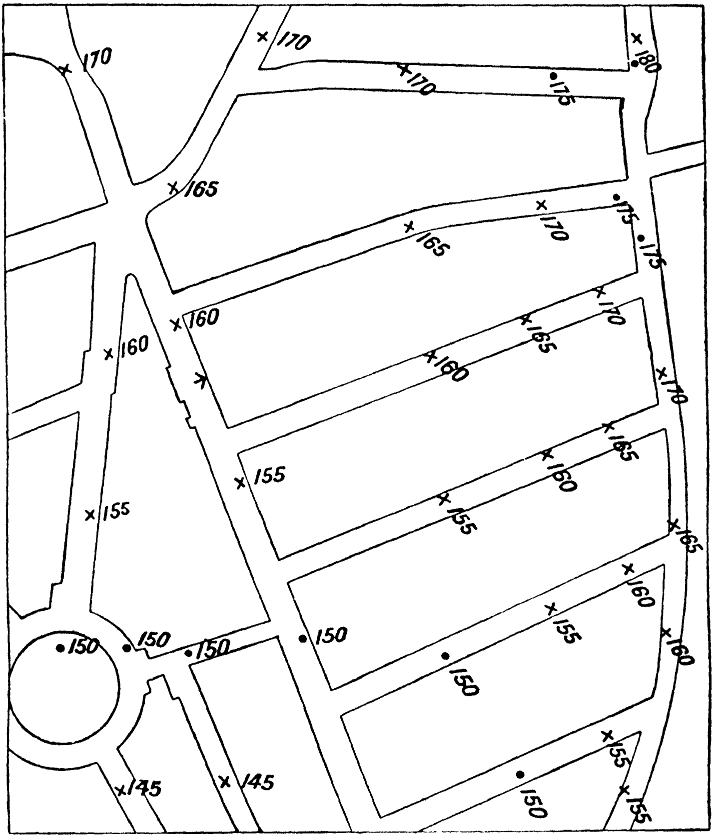

FIG. 41.—Heights of points plotted on a map showing streets.

has taken a much longer time to make a longer series of measurements by many men before the work of finding the height of this bench-mark and others all over the country has been completed.

We have now seen how triangulation networks may be taught to most advantage in the home area. We have yet to show that even latitude and longitude can best be realised from observations actually made in school. Latitude and longitude are not really important in themselves, and the difficulty consists in presenting them in the most satisfactory light. They can very easily be so spoken of as to suggest that they are fundamental in geography. It is sometimes imagined that a boy, or girl, cannot be said to know any geography unless he is fairly familiar with the latitude and longitude of, at any rate, the most important countries of the world, or it is assumed that the best way to show relationships on the globe is by relating each fact to another *through* latitude and longitude networks. This, of course, is not the case. It is as if we assumed that when we knew the accepted order of the letters of the alphabet and could therefore find out a word in a dictionary, it followed that we knew the meaning of the word. Of one thing we are quite certain, that when we *know* two places we do not think of them as being in any way related to each other through the latitude and longitude of each.

The fact is that except in navigation, with which we have here nothing to do, latitude and longitude are important almost entirely because they supply a constructional map-framework. When the building is constructed, the less the framework is heard of and seen the better. Latitude and longitude have their uses in school teaching. Being essentially a framework they may be used after the manner of a dictionary to indicate on a map where the name of a place is. But their uses are strictly circumscribed, and just because of their unfortunate school associations it may be advisable to limit their use even when the use is legitimate. Being lines, and imaginary lines at that, they come late into school work, and when they are introduced it is essential that they should be introduced in the setting in which they can run least risk of being misunderstood, *i.e.* in connection with home geography. Naturally there are several stages in the work, and much besides latitude and longitude is learned.

Observations of the movements of the sun may be made at about the ages of eight or nine. These observations may be roughly quantitative, but the essential thing is to direct attention to the fact that the sun moves during the day and during the year. The former is of course easy and takes little time, though it is necessary that a little time should be taken every now and again with the object of getting the children to make the observations for themselves. The midday height of the sun may also be roughly noted. It is advisable, therefore, that one geography lesson a week, if not more, should be arranged to include, or end at, noon, and that the room in which the lesson is taken should face south, or at any rate should face in such a direction that the sun shines into the room at noon. There is then no need to erect vertical sticks which will cast shadows. All that is necessary is that the class should notice how much farther the sun comes into the room through a particular window in winter than in summer. Marks may be made on the floor and dated. If it is thought desirable the movement of the shadow of a particular corner of a particular window may be noted during lessons and recorded on wall or floor.[1]

Somewhere about the age of ten or eleven pupils may make more accurate observations of the midday sun during the year. Two boys at a time may make the observations by means of the instrument in fig. 42. This is merely a large quadrant (AB is about 20 inches) placed vertically on a base and marked with degrees. It has a thin iron rod bent at right angles at O, and slipped through a hole in the quadrant at that point, so that it is free to turn round O and act as a pointer. On to this bar at P and Q two little pins, each about one-tenth of an inch thick, are soldered so that they are at right angles to the surface of the quadrant. The pointer may also be formed of a piece of wood into which nails are inserted; the hinge may be a bolt and fly-nut. To use the instrument it is placed in the sunshine with its base approximately horizontal, and turned so that no shadow is cast on either side of the quadrant. The pointer is then raised till the shadows of the two projecting pins coincide. When this happens the pointer must be directed exactly towards the sun, and the angle of elevation of the sun may be read

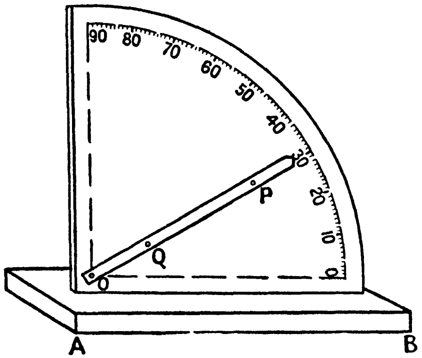

FIG. 42.—Quadrant with which the altitude of the sun may be measured.

[1] Incidentally, the teacher will learn by such a simple observation what the equation of time really means.

off. The advantages of the instrument are obvious. The principle on which it works does not require to be explained, and small boys can quite easily understand it. The disadvantage, that it requires to be levelled for really accurate work, is not serious, as at this stage comparatively rough observations are all that is necessary. The base need not be exactly horizontal, though if observations can be made on an absolutely horizontal base so much the better. For the same reason the observations need not be taken at true noon; twelve o'clock will give quite satisfactory results.

There will not, even at this stage, be any reference to latitude and longitude. The work is, however, of use for correlating with observations of temperature, and hence impressing ideas of temperature seasons.

At about this stage the path of the sun in the heavens during a day and during a year may be observed and recorded in another way. "A number of thin rods (*e.g.* long knitting-needles) are mounted perpendicularly at equal intervals along the circumference of a circle marked on a drawing-board. Each rod carries a small paper or cardboard slider. The board is fixed horizontally in sunshine. As from time to time during the day the shadow of one of the rods falls across the centre of the circle, the slider is so adjusted that its shadow covers the centre."[1] When at the end of the day the sliders are all in place we have a graphic record of the path of the sun across the heavens. Records for other days may be constructed in a similar way. The instrument will carry a number of daily records, but if permanency is desired it will

[1] *Report on the Teaching of Science in Secondary Schools*, p. 39.

probably be well to enter the heights that are registered on a sheet of paper, whose length is equal to the circumference of the circle. Then a smooth curve may be drawn through the points for each day.

Also at about this time the idea of difference of time in different parts of the world may be suggested. In the past, clock time for Dublin set the standard for Irish clock time which differed by nearly half an hour from English clock time, and exercises dealing with the published times taken by vessels to go to and to return from Ireland afforded an excellent introduction. By a curious chance Irish clock time was altered to English clock time; this is probably a temporary condition of affairs, and the opportunity of introducing the idea of differences in time in this way may return. In any case there is the fact made obvious by wireless, if in no other way, that time in America is very different from Greenwich time, and this again may be elaborated and the idea of time belts presented.

Now we have built up our scheme, and the whole of the work may be brought together by presenting longitude lines as time lines and latitude lines as sun-altitude lines. At about this stage the exercise suggested in Chapter XIII, p. 174, may be taken, and this, with subsequent work, will also exhibit latitude as determined by the midday altitude of the sun. If a curve of midday altitudes can be constructed from observations taken at another school considerably farther north or farther south, a constant latitudinal difference will be evident. If the distance between the two schools is known, this may be used in order to calculate the size of the earth.

Work with sun-dials is also useful, especially if the mathematicians can be induced to do the work. The style of the sun-dial is placed parallel to the axis of the earth, and the plane of the dial perpendicular to the axis or parallel to the plane of the equator. The apparent variation of the direction of the style with the variation of latitude may be considered, and observations may be made to show how long it takes for the sun to move 1°, etc., as a preliminary to using the instrument in order to find the time.[1]

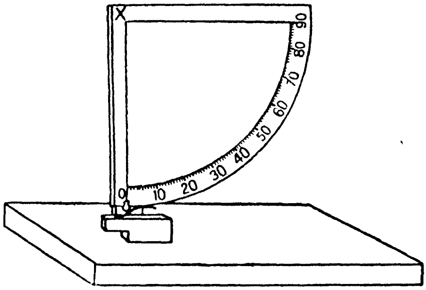

FIG 43.—A quadrant to measure the altitude of the sun This is a smaller instrument than that in fig 42.

Even this, however, does not complete what may be done. With some knowledge of the meaning of latitude and longitude we may proceed to determine as accurately as possible the actual latitude and longitude of the school. A very simple and accurate little instrument is shown in fig. 43. It consists of a quadrant some 6 inches in radius mounted to swing round a point X. At the point X is a pin from which hangs a thread with a weight. To use the instrument it is turned till the shadow of the pin lies across the scale. As the instrument is still farther turned the shadow lengthens. When the shadow is just on the point of disappearing, the plane of the quadrant is so nearly

[1] The graduation of a sun-dial on a horizontal surface will certainly be left to the mathematicians. See *Handwork and Geography*, Pickering and Robinson, part ii, chap. x.

directed towards the sun that no sensible error is made in the reading. The quadrant is adjusted till this shadow lies exactly on the 90° mark; if a spring is inserted below the quadrant, it will remain in any position in which it is placed. If the sun is just on the horizon, the vertical thread will hang over the 0°. If the sun is at an altitude of 10°, the quadrant will require to be swung so that the thread will hang over the 10° mark. Obviously the altitude of the sun can be read off at once by noting the reading covered by the thread.

By this instrument the altitude of the sun may be observed at intervals during a school day from nine o'clock in the morning till four o'clock in the afternoon. With these observations we can find the latitude and longitude of the place where the observations are taken. We require, however, to know (1) the exact Greenwich time at which each observation was made; (2) the equation of time; and (3) the declination of the sun.

In these days of wireless, Greenwich time is easily come by. The equation of time may be found thus. The times of sunrise and of sunset on the first day of the month at Greenwich [1] are taken, and the time midway between them, or midday, is calculated. This differs from twelve o'clock by a certain varying amount. That amount can be easily found, and a curve may be drawn showing the variation during the year. From this the equation of time for any particular day of the year may be read off. *Whitaker's Almanack* gives the equation of time for each day more accurately than does the graph, and it may be thought advisable

[1] *Whitaker's Almanack.*

to use *Whitaker* for the calculations, but there is this great advantage in obtaining midday directly from times of sunrise and sunset, that it emphasises what the equation of time really is, and that it helps to drive home how extremely accurate the observations must be if the result is to be at all accurate.

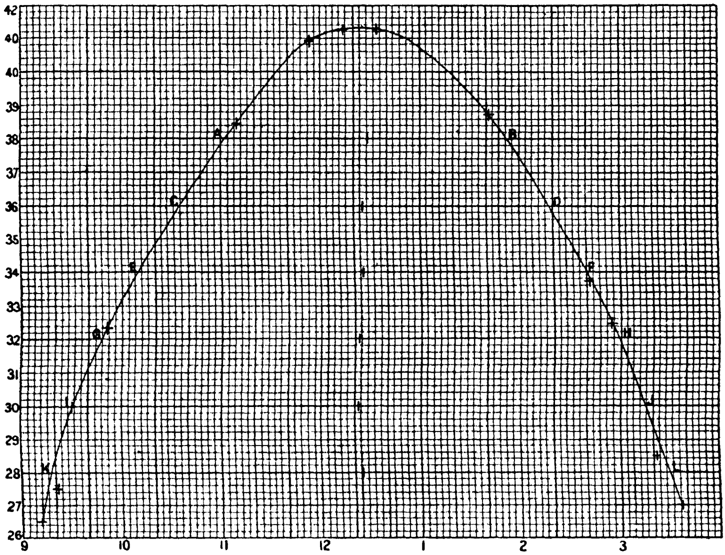

FIG 44.—The altitude of the sun plotted on squared paper. The altitude, in degrees, is the vertical scale time, in hours, is the horizontal scale The plottings are marked by crosses. The diagram is reproduced on half the scale of the original drawing.

The need for accuracy is again emphasised by the difficulty of obtaining the exact time of local midday from observations. Noon occurs four minutes of time later for every 1° of difference of longitude. That is to say, that an error of one minute in the time of identification of noon will in these latitudes introduce an error of about ten miles. It is extremely difficult to determine from our graph (fig. 44) exactly when the sun is highest in the heavens, as the change is least just at midday. We may, however, use the curve to find midday in another way, in fact very much as we found by calculation the time at which midday occurred at Greenwich. Midday may be found very exactly by drawing lines parallel to the base time line, AB, CD, EF, etc., and finding the mid-points of these lines. Any one of these mid-points ought to give us the time of local noon, but actually there will always be differences between the values obtained. A more accurate value may be obtained by averaging the individual values, or by drawing a perpendicular line as nearly as possible through the mid-points of CD, EF, GH, etc. In fig. 44 the points plotted from observation are marked by crosses and a smooth curve has been drawn through them. The reading of the mid-point of AB is unreliable and is rejected. Noon is at 12.24. Allowance being made for the equation of time, the difference between local midday and midday at Greenwich remains to be accounted for by difference of longitude at the rate of four minutes of time to a degree.

The time at which midday occurs is difficult to read directly from the graph, but the altitude of the sun at the time is comparatively easy. When the declination of the sun, again given in *Whitaker*, is allowed for, the latitude is found at once. Latitude may also be found by a method which appears to be somewhat rough, but which is really fairly accurate. This consists in taking the curve of the midday altitudes (p. 267) through the year, and drawing a horizontal line to divide this curve into two equal parts. There is, of course, no reason why both methods should not be used, part of the class working out the latitude one way and the other part in the other way.

Latitude and longitude naturally lead on to latitude and longitude networks, and though these have little connection with home geography they may be considered shortly here. The matter is, of course, not altogether geographical, but has a mathematical side. Indeed, it is so much on the border-line between mathematics and geography that the interest of some of the networks is certainly geographical, while that of others is equally certainly mathematical. Networks are interesting to the geographer in so far as they are useful for showing the relationship of geographical facts, while networks are interesting to the mathematician in so far as they illustrate mathematical principles. The study of networks to be done satisfactorily in school requires to be divided between the geographer and the mathematician, and the work requires to be co-ordinated. The ball is set rolling by the geographer. The problem naturally arises when the question is raised as to how to show some distribution, or even in the general form of how to make a map of the world. A hint of a solution of the problem may be obtained from the device used for plotting the altitude of the sun (p. 267). This, in fact, is the central cylindrical projection. Nor is a simple network of squares so unsatisfactory as it seems. It does not show areas correctly, nor distances, except that distances north and south are everywhere comparable, but it is simple and has geographical properties which make it for some purposes a good deal better for school use than some more orthodox networks. Areas are not so grossly incomparable as in the central cylindrical and similar networks, while lines of latitude are parallel to the equator, and this makes it suitable enough for school use for many maps showing distributions which vary with latitude.

Criticism of the defects of this network will probably lead to the consideration of the orthographic cylindrical which is strangely neglected in this country, though full use is made of it in Italy for atlas maps. On the other hand, Mercator, which probably teaches more wrong geography than any other network, is still extraordinarily popular.

Mathematicians are for the most part concerned in school with world projections. Geographers have as much interest in networks suitable for small areas as in those suitable for the whole globe. Many of these have great mathematical interest, but as it happens these are precisely those which lie outside our course. The interest of the central conical and the orthographic projections is mainly mathematical rather than geographical, in so far as they have any school interest. Such networks, on the other hand, as the polar equidistant, the simple conical and the modified conical equal area, which are of use to geographers are of comparatively little interest to mathematicians, and will have to be dealt with by geographers if they are to be dealt with at all.

The sinusoidal network which is of interest in school geometry as one representing the globe is also of use to the geographer for that purpose, but more commonly is employed for a smaller area.

We have seen how a study of the home district provides standards by which the size and extent of the rest of the world may be measured and realised. We have now to consider other standards. We may, for example, obtain in the home district data by which to measure and realise other climates. Just as we require standards by which to make real the meaning of so many miles in length, or so many feet in height, or such and such a slope, so we require facts and experiences to make real and precise the numerical values of temperature, rainfall, sunshine, humidity, and other elements of climatic phenomena. This again is a long job.

Just as relief is first introduced qualitatively, so climatic facts may be first introduced qualitatively. One of the most important facts to realise is that the atmosphere contains water vapour. This and the process by which it gets into the atmosphere may be suggested quite clearly, as we have already pointed out (footnote, p. 105), by leaving a saucer of water in the class-room. The disappearance of the water may be noticed and the effect on the atmosphere deduced. A year or so later observations of wind direction may be made. This helps to drive home the actual compass directions in the school district, for it is obviously impossible to record the directions from which the winds blow unless the compass directions are known. Observations of weather vanes may be made, but it is better to note the drift of smoke or clouds. These, and especially smoke from a tall chimney, give the most accurate results, and also require more acute observation, while the compass directions are more definitely thought of and consequently more definitely known. The results may be recorded on an octagonal-shaped figure, as in fig. 45, each observation being recorded in its appropriate square. It is about this stage that stress is beginning to be laid on the importance of rainfall, so the record is made the more valuable if each square is coloured in some way to represent " rain " or " dull " or " fine." It is well not to distinguish more than these three types.

One most important result of taking these observations is to impress on the children what the facts are.

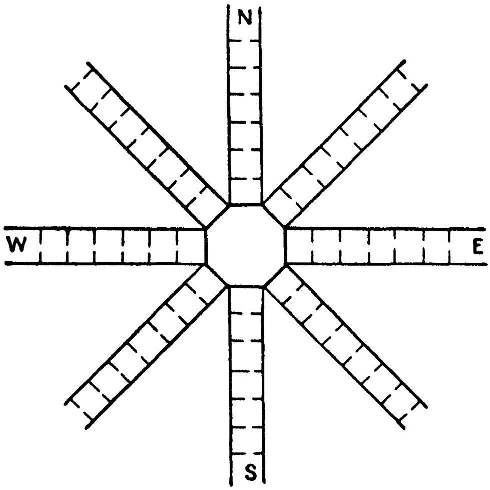

FIG. 45.—A diagram on which the direction of the winds each day may be plotted.

If such observations are not taken one of two mistakes may be made. It may be thought that winds blow from all directions impartially. This is probably the impression of the man in the street. On the other hand, the impression obtained from most of the maps in text-book and atlases, which show the prevailing winds over Britain, is that winds always blow from the west. The truth is evident if observations are made.

No satisfactory deductions can be made from less than a (school) year's records. A term may quite easily show a preponderance of east winds, especially in the spring, or a preponderance of rain with other than westerly winds. From a year's observations we can however deduce—(1) that while winds do not by any means always blow from the west, there are more westerly winds than winds from other directions; (2) that on the whole, though by no means always, rain falls more often with westerly or southerly winds. Here also we have emphasised in a perfectly simple way the necessity for what is to small boys and girls a long series of records; we have, in fact, put the individual observation and the average each in its proper place. This is most important, and the lesson learned may well be carried over into later work with benefit both to pupil and teacher, who both tend to be obsessed by averages. But perhaps the most important result of the work is that, by harmonising the impression of the man or boy in the street with the hard scientific generalisation of the text-book map, we tend to eliminate the suggestion that the facts of the class-room are different from facts outside the class-room.

In the next year definite numerical temperature measurements may be made. It is best to start with a series of observations through a day. Incidentally this may quite well help the mathematicians by supplying an introduction to plotting graphs. All that is necessary is to draw a horizontal line, and at the points which represent the times of observation draw thermometers showing the mercury at the observed height. It is easy to suggest what were the temperatures at intermediate times. Thus we have in effect a continuous series of observations varying from moment to moment. It is this continuity and variation, so seldom emphasised in teaching, which it is necessary to realise. We deal with observations taken, say, at seven o'clock, or with averages of these observations. Such averages are very necessary, but they are lifeless things unless at the back of them we have the clear consciousness that we have this continuity. Without this consciousness averages will pretty certainly be taken to mean something other than reality. If this work is repeated occasionally throughout the year, it may be related to the results of observation of the midday altitude of the sun, especially if the altitude of the sun is observed in the same class.

This correlation may, of course, also be made in the next year by taking daily observations at a fixed time, say 9 a.m. In the light of the previous work the significance of these observations is not so likely to be misunderstood, and we obtain some definite numerical facts by which to evaluate the numerical expression of temperatures which are experienced elsewhere. It must, however, be stressed that it is necessary to associate *sensation* with observation. Just as one aim in surveying is to know what a slope of, say, 1 in 40 *looks* like, so one aim in taking these observations is to know what a temperature of, say, 50° F. *feels* like. Such "feelings" are, of course, not very accurate, as is borne out by the common experiment of placing right and left hands in waters of different temperature, and then interchanging them; but this does not make it less true that it is the sensation which is important, and that we can understand what a particular temperature feels like only by direct association of temperature readings with sensation.

These readings, if taken regularly, may also be utilised to give some kind of conception of that very elusive thing an average temperature. It is in connection with averages, and perhaps specially with average temperatures, that difficulty occurs, and it is well to recognise the fact. The idea of an average is simple. The readings for a month may be taken and the average for the month found. This is not beyond the comprehension of the normal third-form boy. He may even understand that if the readings for the same month be taken for thirty years, we obtain another more accurate average or mean. This is all to the good. But it is an intellectual assent to the accuracy of an arithmetical process. Neither he nor anyone else has ever *felt* a mean temperature of 50°. It is merely a counter in a game. It may not, and most probably does not, have the same value as another counter also labelled "50°," which represents the mean temperature for the same month somewhere else. It may be suggested that while these mean temperatures are useful and should be used, it would be well when the temperatures of places other than the home region are studied to quote, if possible, a succession of actual temperature readings.

Even the mean temperature obtained from daily readings is unsatisfactory from the scientific point of view. The only really true and satisfactory value is the mean obtained from all the successive readings during every instant for twenty-four hours. In practice this is impossible. A figure that does not differ appreciably from the real mean is that obtained by averaging twenty-four hourly readings. Even this is practicable only at meteorological stations of the highest class. Various formulæ use fewer readings, which give the mean with greater or less error, and it is well that pupils should eventually know this; but the simplest, if the least exact, is to average the maximum and minimum readings. These readings may be made by a slightly more advanced form and the argument carried a stage farther.

The actual place and manner of temperature observations is important if readings are to be sufficiently accurate to be comparable with those taken elsewhere. A "Stevenson" screen in an open situation is desirable and not unknown in schools, if rare. But fairly satisfactory observations may be made almost anywhere. The case is otherwise with rainfall. It is usually distinctly difficult to obtain anything like satisfactory readings from school rain-gauges. Thermometers need not be continuously exposed, but will give satisfactory results if exposed for a few minutes before they are read. The rain-gauge, however, requires to be continuously exposed, and there is all the greater chance that it will be tampered with, either accidentally or on purpose. Even when this possibility is eliminated, or reduced to a minimum, there remains the difficulty of finding a suitable site for the gauge. To give results that are reliable and comparable with standard readings, the rain-gauge must be placed at least no nearer to a building than the height of the building, and no nearer to a tree than twice the height of the tree. Also, it should not be placed so that it is exposed to an eddy, say, on a sloping bank, nor so that rain may be blown out of it by strong winds. All these conditions are difficult to come by. This, luckily, is of less account than might be supposed. The principle of measurement, as we have seen (p. 104), is not geographical at all. It can be comparatively easily understood, and when it is understood there is not very much more to understand, apart from the causes of rainfall with which we at present are not concerned.

The scheme of measurement is much more easy to understand than that of temperature. There is, it is true, a difference in plotting graphs of rainfall which is *for* a period, and graphs of temperature which is *at* a time, so that temperature is shown by a continuous curve, while rainfall is not, but this is not really serious.

What is much more important is that temperature has negative values according to either centigrade or Fahrenheit scales, while rainfall has no negative values. We can speak of one place having double the rainfall of another, whether the rain be measured in centimetres or inches or any other unit of length; that is to say, we can use the simple everyday methods of comparison. But we cannot say that one temperature is twice another. This is one reason why the actual measurement of rainfall is of less account than that of temperature, seeing that we must obtain a "sensation value" for many temperatures, while we need have only a few for rainfall. Knowing what half an inch of rain is we can form an idea of an inch, but a knowledge of what 32° F. feels like gives no help towards the appreciation of the sensation of 64° F.

It may be suggested that other observations not so commonly made, those of the wet- and dry-bulb temperatures, are really of more value. By means of these we obtain information as to the humidity of the atmosphere. Obviously this provides work for an upper rather than for a lower form, since work of this kind amplifies both the temperature and the rainfall observations. Where human beings are concerned it is the wet-bulb temperature which is really important, because that temperature, far more nearly than the temperature recorded by the dry bulb, registers what we *feel*, at least in the case of high temperatures. A temperature of 90° F. on a dry day, with a good breeze, is less oppressive than one of 75° F. when the air is saturated. For vegetation, humidity is important in another way. Rainfall which is associated with high relative humidity " goes farther " than a higher rainfall with a lower humidity. Western European rainfall is more effective, inch for inch, than is the rainfall of the Eastern United States. London and New York might be considered to have the same effective rainfall, as far as vegetation is concerned, but actually London has 25 inches annually, while New York has 45.

Near the top of the school we are forced to consider what we shall do about cyclones, anticyclones, pressure, the weather report and the like. Without being dogmatic the author is very strongly of opinion that the question of pressure should be deferred till late, and, indeed, if it is deferred out of the school syllabus altogether. no very great harm will be done to geography. In any case it must be delayed till the barometer and Boyle's Law have been studied in the physics course. This does not mean that nothing should be done earlier to enable boys and girls to understand some of the causes of the weather, which integrates into the climate, of the home region. On the contrary, it is precisely this work which is necessary if the pupils are to realise causes of climate operating over the globe. In practice there need be little difficulty about this. Boys certainly, girls probably, wish to know what the weather is going to be like on the Wednesday half-holiday or over the week-end, whether any interest is taken in the weather of the rest of the week or not. They wish to know how to interpret the maps in the weather report for themselves, and work that is done may very well have this definite object. Observations of the wind may be related to the observations taken elsewhere at the same time, if that is possible, and certainly observations taken at the school later than any published elsewhere should be thought of as throwing light on the general weather changes in the home area.

The emphasis should be placed on air movement and air currents. A cyclone may, in fact, be looked on as a particular kind of current system, and introduced as such to the class. The observations of wind direction in Western Europe for successive days may be plotted on maps, and conclusions drawn as to the "movement" of the cyclone. The relations of wind currents to weather (rain, temperature, sunlight, humidity and the rest) may be noted. The changes both of wind and weather in the school district will acquire significance and throw light on what may be expected that afternoon or that week-end. Pressure need not be mentioned; the isobars on the map may be glossed over as lines which in a general way show the wind directions, as indeed they do; they would, however, probably show the different wind currents a great deal better if they had more "corners."[1]

[1] Nearly all lines shown on maps, such as contour lines, isobars, and isotherms, have much too flowing curves, and in all of them it is the "corners" which are of most importance (cp. p. 161).

If pressure is studied not only must the school barometer be read, but the readings must be corrected for temperature of the air and temperature of the barometer, and they must be reduced to mean sea-level and latitude 45° in order to make them comparable with readings taken elsewhere. It is, indeed, the relationship set up with places elsewhere that makes barometer reading, in common with all other observations, valuable at all. Taking observations of the barometer merely for the sake of plotting a curve is absolute futility.

Whether the barometer is read or not, we again see that a study of the home region enables us to understand something of the world, and actually places us in touch, and in what may be called continuous relationship, with neighbouring districts. This inculcation of the continuous relationship of the home district with the rest of the world is the chief value of such a study, as it is of the study of relief and map-making in the home area.

It is not only in regard to map-reading, relief and climate that the home region is useful. The study of what has been called physical geography as a whole can be made more real by reference to phenomena which may be observed near the school. Land-forms acquire meaning only in so far as reference is made to, or work done with, local examples. These may be not only mapped but studied. They may be mapped not only instrumentally but by eye, and indeed the mapping by eye is much the more geographical exercise of the two. If a hill or valley is not to be seen, a potato-pit or a heap of rubbish, a puddle in the middle of the road or a gutter by the roadside will provide work for contour mapping by eye. And if even the simplest of land-forms are looked at, many of the fundamental processes of physical geography will be noticed, erosion and deposition, and the action of frost and of rain, of sunshine and of wind. But a school is very exceptionally situated indeed if a river and a river valley cannot be visited, or at least are not available for reference. It is true that exceptional conditions do prevail, say in the centres of some cities and in chalk districts, but they are not so common as might be supposed. Of course, also, it need not be pointed out that many schools, both in the country and the town, have very much better opportunities for study at first hand of phenomena which come under the head of physical geography, than has been indicated as the minimum.

But this is not all. It is customary for teachers in town schools to complain that they cannot teach out-of-door geography, because they do not live in the country. This seems to imply a very one-sided conception of geography. The truth probably is that a teacher in a town school has on the balance greater opportunities for utilising local geography in his teaching than has a teacher in the country. Of course he may not have all the examples of physical geography that the latter has round him, but he certainly has more of the equally important humane aspects of the subjects to which he may refer. Not that the teacher in a country school has none of these. He probably has the fundamentals of humane geography before him and his pupils, just as the teacher in a town school has the fundamentals of physical geography before *him*.

That must again be a very exceptional school district which cannot supply examples of settlement and movement, of markets, routes, and the elements of economic and historical geography, while many city schools have at hand much more than the fundamentals. The fact of the matter is that while no school region contains everything that we may desire, yet nearly every school district has most of what is absolutely necessary, and every school district has certain advantages of its own, which other schools would give much to possess. In one district the processes of agriculture or the types of rocks and soils may be observed. In others we may use the destinations of tramcars and omnibuses, a historical site, a factory, a national museum, a world-famous market, or the market of a country town, docks and locks and tides, the shady road that does not dry quickly, a court-house, bricks and stone, waterfalls and meanders, the contents of barrels and boxes at the railway station with the places of their origin or destination. There is always something, and usually much, and it is the business of the teacher to use to the full all that he has.

Even the most unpromising districts in the hands of an enthusiastic and farseeing teacher may be found to be rich in geographical material. On the face of it, a slum school in the Commercial Road, London, filled with dockers' children, does not seem to afford much opportunity for work of any kind that is worth doing. The teacher with originality, however, turns his very disadvantages to advantage. He uses the docks for all they are worth, gets the children to bring him information about the commodities that their fathers are handling, and ends by exciting such interest in geography that one is almost persuaded that dock-land is the only satisfactory place in which to teach geography. The front doors and windows in Fleet Street have the names of almost all the newspapers of the British Empire inscribed on them, and even without the assistance of a gazetteer or directory supply illustrations for many geography lessons to a school in the neighbourhood, while the extraordinary ramifications of trade are emphasised by noting the business occupations of people in the same area.

In the *Geographical Teacher*, Autumn 1913 and Spring 1914, Professor Fleure made most helpful suggestions as to the subjects which may be noted in a school district. Some of these are of more importance in the country and some of more importance in the town, but all are of value. He specially notes the arrangement of buildings and open spaces, the kind of food eaten, the site of the village or town or borough, and the activities of the people, and among other things he suggests the study of the types of transport vehicles, the kinds of things carried, methods of obtaining water, types of agriculture, classification of place-names, methods of marketing produce, road-metal, types of roofs, and a house-to-house study of occupations.

It is in such work as this that the Ordnance map comes into its own. Work with Ordnance maps far too often consists in memorising symbols employed on the map, but in work on the school district the Ordnance map is really *used*, and the symbols fall into their proper places. The function and position of the map in geographical work is here realised most clearly. It is not absolutely necessary; much local geography can be done without it, but it is an extraordinary help, an enormous saving of time, if nothing else.[1]

All the subjects of study which we have instanced are essentially geographical, and it cannot be said that there is any lack of material in cities. Indeed, one imagines that the next we shall hear is that there is too much and that there is no time for it all. But we must point out that such work need take up little *school* time. With only an occasional school lesson, Mr Valentine Bell carried out a most comprehensive survey of Lambeth. Photographs of the district were taken from the roof of the school to form a continuous panorama, and objects were identified both on the spot and on the pictures. Sections of street maps were then given to the boys to fill in, in various ways, *e.g.* to show the styles of the buildings and the date of erection, the situations and names of the public-houses, the trades carried on, and the bus and tram routes. Pictures were collected showing the development of the district; the evidence for old conditions, for example as given in names, was found and noted. Boys got into the habit of looking down excavations, noting what was to be seen and plotting observations. They watched from the Albert embankment for barges and lighters, and noted the cargoes. Sections of the well supplying Lambeth baths were obtained. Old maps and charts were consulted and the history was studied, showing how the conditions that existed had come to be.

[1] Ordnance maps are, of course, very useful in the detailed study of any region, as is evident from Dr Newbigin's *Ordnance Survey Maps, their Meaning and Use*, but large scale maps best fulfil their purpose when used on the ground which they represent.

Here we are coming to understand the real use of the home district. Hitherto we have rather suggested that it is a laboratory or workshop or museum of specimens. But it is much more. It is a full-size working model. The individual phenomena are not isolated phenomena. They form a unity. The most important thing which may be done with the home district is to get the pupils to see it whole, as a unity, to see that all the various parts fit together.

It may be objected that such work is never "examined," and that, consequently, the time cannot be spared for it. As to that, three things may be said.

First, as we have already said, such geography takes up little time. Perhaps in the last year of a secondary course some weeks may be spent on local geography; it is an extremely good way of pulling the study of the world together. After examinations are over, also in the last year of the same course, there is usually a month in which there is a certain repugnance to ordinary school work, but in which the study of local geography is welcomed even by teachers who do not believe that it pays in examinations.

Secondly, examinations are by no means everything, and a teacher is not so much judged by them as he often supposes. If he turns out boys who can take their places in the world, the parents will recognise his worth whether the boys pass examinations or not. It will be the examinations which will fall into disrepute. Such work does enable boys to take their place in the world. Mr Valentine Bell tells us that in his class which studied Lambeth there were fifty-six boys, of whom thirteen were truants, but not a single case of truancy occurred during the year. "They had been designated as poor at oral work, but after a year's working they were declared by an inspector to be decidedly sharp. There was not a single boy who could not have conducted a visitor to any place in the immediate neighbourhood of the school."

But, thirdly, such work *does* pay in examinations, though never a question be asked on it. The work which is examined acquires a much greater meaning when reference is constantly made to local conditions; it is carried on with greater zest; more is done with less expenditure of energy; the rest of the work is felt to be dealing with real things; words acquire a richer connotation and are less and less mere counters. The pupils come to have an extraordinarily increased ability to talk sense about geographical facts, and they do not make howlers which spoil many an examination paper and are the despair of teacher and examiner. In effect the work *is* tested in examinations.

The influence of the home district should permeate every lesson so that the rest of the world is understood. It is in fact pretty true to say, that any lesson which does not appeal to conditions known and realised in the school district is much less good than it ought to be. This is a benefit not only to the understanding of other lands but to the understanding of the homeland also. In a very real sense the homeland is measured by other lands: also, unless it is seen in its setting, and specially as it is seen in its world setting, it is not really understood.

We may now return to the subject of teaching the home region for its own sake. It is a commonplace of teaching that the teacher knows the object for which the work is done, while the pupils do not. But this does not mean that the children should have no aim in their work and merely do as they are told. It means that the pupils have one aim and the teacher an additional one. The aim of the pupils may be to play a game of ball, while the teacher may desire to exercise some particular muscle. Now for whatever purpose the home region is studied, it must be studied a bit at a time, each new bit taking its place in a gradually developing conception. In the mind of the teacher there may be the ever-present idea that he will use the home area to measure the world, but this is not the point of view suggested to the pupils. For them the interest will lie in the fact that they are studying the home region for its own sake. They are interested in understanding the facts which condition their own lives. This is surely worth doing. So we end the chapter as we began.

CHAPTER XIX

" THE REST OF THE WORLD IN DECREASING DETAIL "

We have spoken in the last chapter of the use of the home region in giving scales by which the rest of the world may be measured, and have looked at the matter from the point of view of the home region. Let us now consider the principles on which we are to carry on the study of the world.

Measurement implies not only a scale by which to measure, but in its simplest form some definite numerical expression. We may speak of a " wet " region or of a " dry " region. The use of these terms does imply some kind of a scale, but we introduce a definite scale and reduce the measurement to numerical value when we say that it has so many inches of rainfall, or so many days with rain, a year. We may speak of a " hot " region or of a " cold " region, but we again introduce a definite scale and numerical values when we speak of degrees of temperature. This all makes for precision.

Economic geography also acquires precision by the use of quantitative values. We learn not only that coal is produced in Britain, but how many tons are produced ; we learn not only that wheat is imported from Canada, but how much. This is all to the good if the fundamental principle is remembered that figures are introduced when the children have been prepared to receive them.

Such figures by themselves are, however, of little value. They may easily be made to acquire significance, but as a matter of fact the raw figures as they stand mean very little to the adult and still less to the schoolboy or schoolgirl. A "dry" climate means more to him than "10 inches of rainfall." It is only when some standard of comparison is introduced that figures begin to mean something. The invaluable standard is, of course, that supplied by the home district, but sometimes that is not directly available and sometimes it is not entirely suitable. Then figures, whether climatic or economic, may be compared with each other by means of exercises done by the pupils.

Graphs of one kind or another may be made to appeal to the eye, and these help to emphasise the significance of the figures. They may be drawn to compare one month with another, and to show the variation through the year as in the case of rainfall and other climatic elements, or they may be drawn to compare one year with other years, or one place with other places. The *Statesman's Year Book* and the *Statistical Abstracts* for the United Kingdom, the Colonies and Dependencies and Foreign Countries are available, and supply a vast amount of data that may be used in school. It is not, of course, necessary that every pupil should do the same work. The value of the comparison is all the greater if different members of the class, or different sections of the class, do different pieces of work and discuss them together.

But it should be noticed that these exercises, and still less a multitude of such exercises, are not geography or anything else of very great value if nothing further be done with them. A common result of the construction of graphs is simply to interest the children in the mechanical exercise of drawing them without impressing on them the importance of the facts. It is good that the children should be interested in the mechanical excellence of their work, but that is not the main point; it is only a means to an end. One graph is very like another and they are apt to be confused; if this happens the last state of the class is worse than the first. Herein lies another advantage of arranging for different members of the class to do different graphs; there is less emphasis on the graph as such and greater emphasis on the comparison.

The aim in drawing those graphs is to show the relationship between quantities. But this is not the whole aim. The work should lead to the acquirement of the habit of comparing figures *without* drawing graphs. The comparison may be quite rough, and, indeed, it is better to think of the relations in round numbers; one quantity may be thought of as double or treble or two-thirds of another. The town in which one lives is found to be twice, or a half, the size of another. But even this is not enough; the drawing of the graphs and the thinking of the relationships of the figures is of very little value, unless the pupils are thereby trained to think of what the figures really mean. They must be translated in the mind just as maps are translated (p. 188) so that they stand for realities. If the definite attempt is not made to *think* what a figure stands for, it is only another graven image hindering rather than helping the understanding of those things which it is our object to study.

The value of statistics is undoubted. They are definite facts which cannot be gainsaid, and, always supposing that they are introduced at a suitable place and time, and are treated satisfactorily, have a stimulating effect not only because they are definite, but because they have to do with the real world. But whether figures and graphs are a help or a hindrance depends entirely on the way in which they are treated. We are, however, here dealing with a much larger question, and it will be convenient now to discuss that larger question.

Generalisations and classifications of particular facts are necessary for the scientific study of any subject, but generalisation is of extremely little use if it is not based on an intimate knowledge of particulars. It is in fact the age-old problem of the reconciliation of the claims to recognition of the individual and the organisation. The teaching maxim is plain, "from the particular to the general." The particular is the living thing, and to the child, and the adult too, the interesting thing. For one person who is really interested in the great events and teachings of history, there are tens of thousands interested in the doings of particular men and women, real and imaginary—Alfred and his cakes, Bruce and his spider. Hence the popularity of the stage, the story, the kinema and the chronicles of particular men, women and even horses in the daily press.

Of one thing we may be sure that if we take the instruction in many syllabuses, quoted at the head of this chapter, to mean that we are to learn the world more and more by generalisation, then certainly we are wrong. If for no other reason than that we must take into account the likes and dislikes of pupils, we must base our work on particulars, whether we are dealing with things near at hand or things far away. We do so in teaching other subjects. We and our pupils work particular sums in arithmetic. In science, whether physics, chemistry, or botany, it is recognised that generalisation is of use only when the children have handled the particular. Language work also is successful only when the particular has been dealt with—particular words, sentences, essays, poems, or dramas. It is one of the weaknesses of the teaching of geography that this principle has not been sufficiently recognised. In geography, as in history, boys and girls have been taught, though they cannot be said to have learned, generalisations without having been taught to generalise, or, what is more important, to think what the generalisations mean. It is absolutely necessary, whether we deal with China or with home geography, that we deal with particulars.

Further, it is wealth of detail in particular cases which is necessary. One can know the world well only by knowing some selected things extremely well, it being understood that the things selected to be known extremely well are selected with care and discrimination. Of course no one need expect success merely by introducing a plethora of details. This is the mistake of those who make their pupils draw too many graphs. But it is not the introduction of many details which causes trouble; it is the introduction of irrelevant details. Some geography lessons may appear dull, uninteresting, and overloaded with material, which really contain less matter than others which retain attention to the end, because the latter are full of illuminating details which help to give a unity to the lesson and make it, as we say, living.

Here we are touching the core of the matter. For convenience and efficiency in school the curriculum is divided into " subjects." Of the relationship of geography with the other subjects, and of implications that follow from those relationships, we have already spoken, but something remains to be said. As far as the natural sciences are concerned, we need merely say again that because geography is a science we must in school deal with it as we deal with other sciences, and use particular cases on which we may found generalisations as legitimately as we found generalisations in the natural sciences on particular instances.

In primary schools the humane subjects are English, history and geography. In theory English includes the practice of language and the study of what has been written; actually it may include a good deal more. In schools doing more advanced work other languages also are studied. Though the tradition is changing slightly, French is usually studied merely as a language, and for its own sake, just as physics or chemistry are studied in order to know physical or chemical facts. Latin is sometimes taught as a language, and a very dead language at that; sometimes it may be said to take the place of English as a cultural medium; the same may be said of Greek. History in school is not often taught as a humane subject, though it ought to be so taught. Geography at one time was certainly not humane: now it has better claims to be considered such.

Roughly, however it works out in different schools, we have the trilogy of the humanities represented by history, geography, and English (or the classics), man in time, man in space, and man expressing himself in the written or spoken word. These are, of course, not in water-tight compartments. They overlap a good deal. It is something of an accident whether a particular story is also history, or whether the tale of a particular happening is literature. If the tale has not caught the fancy of some artist in words, it remains plain history; if the story is an imaginative piece of writing, it may not be history at all. But there is a greal deal of overlapping in history and English, though the function in the curriculum of the same story may be entirely different when considered as history, from that which it has when it is considered as literature. In the same way history and geography overlap; the same material may at once have a historical value and a geographical value. So also English and geography may overlap. Further, while it is not common, it is possible that a piece of literature may be equally important as history and as geography. A classic example is the story of the cry of "The sea, the sea," told by Xenophon. The form in which the tale is told is such that it ranks as literature. The story takes its place in the sequence which we call history, and the geographical bearing of the story is sufficiently obvious in that it stresses the importance of the sea generally, and especially of the sea to the Greeks.

This "overlapping" is not to be wondered at when one remembers that *man* is not divided into subjects. He lives his life as a whole, and it is in preparation for this life that children come to school. The overlapping is all to the good, and all that need be said further here is, that a great deal more might be made of it than is made.

In contrast an entirely unsatisfactory result follows from the practice of treating in compartments what is really one whole. Many things are omitted altogether, because they cannot be clearly pigeon-holed as belonging to one or other of the accredited subjects. English and history and geography do not include all of "living" between them. On occasion one item or another may be more or less accidentally referred to in a lesson. This in truth is one of the many practical and often unrecognised advantages of studying literature; men of letters are at liberty to write on any subjects of worth to men, and do sometimes deal with matters which do not fit into places on the procrustean bed of the curriculum, and these matters "explain" themselves or perforce have to be "explained." It is, indeed, just because these incidental allusions allow of explanation and exposition of so many things—material, metaphysical, practical, philosophical, and religious—that literature, ancient and modern, in the hands of a good teacher, may form such an admirable humane study.

But, partly because teachers are curiously specialised, many most important factors in life may never be referred to, because they are not clearly differentiated as English, or history, or geography. Take a single very simple instance. It has as much bearing on life to know how weaving, one of the fundamental arts, is done, as to know the answers to the following questions, all of which were asked in different papers at the same public examination. "Arrange in their order of date the names of the following writers, and mention one important work of each: Swift, Carlyle, Goldsmith, Spenser, Coleridge, Browning, Lamb, Addison." "What are the chief vegetable productions of tropical America? State where each is produced and the conditions favouring such production." "Write notes on three of the following: (*a*) the siege of Limerick; (*b*) the Mutiny Act; (*c*) Dr Sacheverell; (*d*) the reform of the calendar; (*e*) the Middlesex elections; (*f*) Hyder Ali." All these would naturally be known and taught by masters concerned. Yet in a secondary school common-room in London only one master had any ideas as to the fundamental process in weaving, and he was at least a couple of thousand years out of date, seeing that he had obtained his ideas from the story of Penelope's web. Because the dates of writers, tropical America, and the siege of Limerick are labelled as literature, geography, and history, these facts are taught. Because weaving is not so labelled, it is not taught. And the same thing is true of a multitude of things which concern us, from how to build a house to rates and taxes and international affairs. Some of them may be considered in school, but the chances are that they are not mentioned, and certainly not explained. It is the recognition of this lack on the humane side of the curriculum which has lead to the teaching of "civics," under which title a great deal may be taught which it is good for young people to know, but which is omitted from more usual subjects.

The difficulty is, however, too fundamental to be removed merely by the introduction of another subject into an overcrowded course. The difficulty lies, indeed, not so much in that certain things are omitted, for many things must be omitted, as in the spirit in which the teaching is done. If the so-called humane subjects are taught entirely as grammars, as scientific subjects, or as arguments in which emphasis is laid on the knowledge for its own sake, the humane subjects, though they may remain of some practical use, forfeit their title to be called humane. They are dead things.

Pupils may pass examinations in English, history, and geography, and may even gain distinction, and yet fail when it comes to living, just because the emphasis has been laid on the organisation of these subjects, and there is little suggestion that we are dealing with life. Teachers there are who make their subjects living, and these are the successful teachers. As far as this can be put in a sentence and does not depend on the personality of the teacher, the subject is made living by emphasis on the artistic or pictorial aspect of things, the aspect in which detail takes its proper place in building up the picture, which without it is stiff and formal. Detail is the life-blood of all good teaching. Without abundance of it the organism is anæmic and weak and, at the worst, dead. Indeed, we may carry the metaphor to its logical conclusion and use the schoolboy term of contempt in its literal sense, and call it putrid.

We may seem to have digressed considerably from the consideration of the teaching of world geography, but this is really not the case, for what we have said comes to this, that the teacher of world geography must see that the geography which he teaches does, as a matter of fact, deal with the real things of this world in a detailed humane way. It is better, to take a concrete example, to know a good deal about a few cities in China than to know the names of many, or even to know their positions on an outline map. Also, while the teacher must be jealous of wasting minutes or even seconds, he must not take too great care that all he teaches is strictly geography.

Let us take some very obvious cases. Whether in geography or history there is no use referring to agriculture or factories or ports or fishing unless the children have pretty clear ideas as to what is implied by the terms "agriculture," "factory," "port," "fishing." These things are not geography, but no one can understand geography without understanding the meanings of these terms. It is not sufficient to be able to repeat that "agriculture is the cultivation of the soil," or, indeed, to repeat anything. What is more, it is not sufficient to have this single idea unexpressed in the mind, and certainly not still hazier ideas. This is the old definition fallacy again. We do not, in fact, wish to be able to say what agriculture means. It is not the meaning which is desired, but the connotation, a very different thing, much more difficult, and much less necessary, to put into words. "Agriculture" is not a single idea at all, and it will take a long time to build up ideas into the concept. But it must be done, and done deliberately and not accidentally. It may begin, as we have suggested in Chapter XI, with the story of what one particular farmer in one particular place actually does during one particular day, from the time when he gets up in the morning till he goes to bed at night. We shall, at a later stage when the earlier work has had time to sink in, go on to see what he does on different days throughout the year, what another farmer and his men do under different circumstances; thus the differences are realised. Gradually the concept becomes rich and full and valuable, and it is found that not only do the children know what agriculture means, but they know more of what geography means. They are better educated. While apparently losing one's geographical life, one saves it.

"Agriculture" is a word with a vast connotation, and it will take longer than schooldays to understand all that it implies, but boys and girls must appreciate something of that connotation if they are to begin to understand geography. "Manufacturing" is another word used merely as a token, but without some knowledge of the connotation of the word much geography is valueless. And again the necessary ideas must be built up from details. First a particular factory is described, or, better still, seen; details of processes are realised by means of models or pictures, weaving, of which we have already spoken, and spinning about which even less is known; the minor details need not be expected to be remembered, but enough will be remembered to give the desired effect. Pottery-making, ironfounding and mining, if they are spoken of, must be made into realities.

"Commerce," again, is a badly overworked word, used only as a token. Boys all know something of a goods train, but many know little of any vessel, be it liner or tramp or oil-tanker. Still less do they know of the working of a bank or business house. That comes in the arithmetic lesson, if it comes in at all, and of course has no connection with geography! And yet, to put it at its lowest, how can any of the big cities of the world be "explained" without some knowledge of this kind all founded on concrete details? Again, one has to begin, or get the mathematics master to begin, with the working of an individual bank and an individual business house.

Nor must "fishing" suggest merely a net and the names of a few towns. "A few years after the pupil leaves school, he may be called on to consider legislation, which deals with the fishing industry. What is to guide such a citizen in the formation of an accurate and independent view, if all he knows is the names and position on the map of half the fishing-ports of England?"[1] He will have to know rather "why fish are abundant in particular areas, how they are caught and brought to land, and how they are sorted and despatched to market."

Nor is it only the mechanical side of things which must be insisted on. We must know how a farmer, one particular farmer, lives; we must know how a factory operative, one particular factory operative, lives, what clothes he wears, the house he lives in, the hours he keeps; even, if one likes, what he thinks.

The teacher may now perhaps say that with two lessons a week there is no time for learning all there is to know about the world. Nor do we suggest that all there is to know should be known. There are comparatively few concepts like "agriculture" and "manufacturing." The definite consideration of these ought not to be, though it is, omitted. They must be dealt with somehow; but they will be built up of a multitude of details. What the details are will depend on circumstances, and this allows of choice. Other concepts, though important, are not so important, and

[1] *School Geography*, Bradford, p. 40.

again there is choice as to which may be dealt with. It lies with the individual teacher, first to think of those matters in the world which make geography understandable and those which geography may help to make plain, and then to select for detailed treatment those which seem to him, or her, to be the most important. What we would stress is that we should, as geography teachers, refrain from the use of terms which are merely tokens and have not been built up from particular facts. All else is illusion.

And what is true of more or less abstract concepts is true of those things which are strictly geography. We have already said that there is no need to know the names of all the towns in China; it is a vast deal better to learn many details about a very few. They then acquire something which may be called character. It is better to have seen one Chinaman than to have a blurred perception of a composite picture of all Chinamen. It is better to know how a few Chinamen spend their lives than to be able to reel off a long list of "products" from China. To some extent a beginning is made with work of this kind in the earlier part of the course, and what is wanted is that this should be developed along appropriate lines in succeeding years.

But though we do not expect that everything that might be known about the world should be known, we certainly do expect that a great deal more should be learned than, as a matter of fact, is learned in a typical geography course. Far more detail may be learned than is learned, and with less expenditure of energy on the part of both teacher and taught. Children learn sensibly selected details in which they are interested without noticing that they are learning, and having learned they are interested in more detail. There is no time wasted in "teaching." There is all the difference in the world between pumping in knowledge and gratifying curiosity.

What makes *Robinson Crusoe* at once so readable, so convincing, and so easily remembered is the minute, carefully selected, concrete detail. Very great care must of course be taken that the details are not only as in *Robinson Crusoe*, convincing and interesting, but typical and true, so that they will not give wrong impressions and hold up or side-track the progress of learning. It is not all details which help. Some particular instances may give the wrong impression. This, as we have pointed out, is one of the dangers of using many statistics till the children have learned to understand their meaning and use them to advantage. Statistics so definitely insist on a certain truth that the tendency is to forget what the particular statistics do *not* say. It is this weakness of the most carefully selected figures, which is suggested in the sequence "lies, d—d lies, statistics." But used so as to train the young people to evaluate evidence, statistics are very useful. Well-chosen pictures are much less dangerous. They show details, quickly, in their actual relation to each other (cp. p. 229). Books, not specifically geography text-books, may be read. A few pages or even a few paragraphs are often most valuable. This is not the place to supply lists of suitable volumes, but we might refer to *Kim* as supplying an extraordinarily vivid account of many parts of India. The few pages which deal with Greece in Myres' *Dawn of History* pull together much that otherwise is only a "lesson." Such books as Doughty's *Arabia* are stronger meat, but not the less valuable for that reason. Whatever the means employed, if children are to learn fast without thinking or noticing that they are learning, the teacher must select the detail and the methods of using it which will produce the best result.

This, however, is not all. The amount learned is increased by learning details, because the children not only learn these interesting matters, but they are prepared to learn faster those parts of the subject that take study, those that we call "hard," because they are interested in learning, and learning faster they learn *more.* From all points of view learning detail pays.

There is, further, a moral advantage in learning in this way. Learning generalities gives pupils the impression that they know things when they really do not know them. They may be able to talk about "Mediterranean climate," "scarp-lands," or "entrepôt trade," but knowing the name and the definition is not real knowledge. It is right that geography should be organised and scientific, but knowing names and definitions is not science or organisation. It is a sham. Next to the absence of training in map-reading, it is the absence of detail which tends to that unreality which is the deadly sin of geography teaching. It is this kind of learning that discredits schools in the eyes of practical folk. By learning particulars, by learning details, we learn to recognise just what we know and what we do not know—in other words, to be honest. The generalisations which are made will more probably be valid, and this very complicated world will be the more easily understood.

CHAPTER XX

GEOGRAPHY FOR BOYS AND FOR GIRLS

We have almost reached the stage at which we can discuss syllabuses of work. With these we shall deal in the next chapter. In the construction of syllabuses, however, it will be as well to take into consideration another matter of which we have not yet treated, and which must be taken into account in planning work in geography.

It has in the past been assumed that syllabuses of work in geography should be the same for girls as for boys, and that methods of teaching which appeal to boys will also appeal to girls. This, however, is probably not so. Unfortunately, though teachers of experience may have come to certain conclusions based on observation, there is very little direct evidence to prove or disprove the assumption. Examinees, and often schools also, are mere numbers to those who mark the scripts at public examinations. This is all to the good in many ways, but it does not make it any more easy to settle the question with which we are concerned.

Fortunately for our purpose, one public body for which the author officiated as examiner for some nine years acts in a different way. All information as to age, name, school, and sex of each candidate is supplied to the examiner. Some 1000 to 1500 scripts of such candidates were marked each year, making about 10,000 in all. This supplies valuable material from which to draw conclusions.

The material was treated in various ways, each of which tends to support the conclusion that girls react to the same geographical teaching in a different way from that in which boys react.

First the marks for one year were taken, the total of the girls' marks was found and divided by the number of girls, thus giving the average mark of the girls; the average mark of the boys was found in the same way. Whichever year was considered there was a systematic difference between the two. For example, the average marks for one year were:

Boys, 42·56; girls, 36·24.

The difference is extremely significant, and in view of the fact that the same difference was shown year after year, there is at the least a suggestion that there is a foundation for the impression that girls do not do such good work in geography as do boys.

It seemed well, however, to examine the matter more closely. The marks for one year obtained by boys and girls were grouped in fives, *e.g.* the number of girls who obtained 0 to 4 per cent. was found, then the number who obtained 5 to 9 per cent., and so on. The percentage of candidates gaining those percentages of marks was then found, as in the following table, the corresponding figures being found also for the boys.

	Girls' percentage.	Boys' percentage.
90–94	0	0
85–89	0	0
80–84	0·2	0
75–79	0·3	0
70–74	0·3	1·2
65–69	0·3	1·8
60–64	2·1	3·7
55–59	2·3	6·2
50–54	7·2	15·1
45–49	9·6	17·9
40–44	17·1	18·1
35–39	17·4	12·9
30–34	15·9	9·7
25–29	14·7	7·7
20–24	8·2	2·3
15–19	5·0	1·7
10–14	2·2	1·0
5–9	1·2	0·5

Two facts here are noticeable. One is that the best girls are better than the best boys; of this no more will be said, except that examination of the marks in other years corroborated this conclusion as a general rule. The most important fact, however, is that the girls as a whole did not gain as high marks as the boys.

(*a*) The largest groups of boys were those who obtained marks between 35 and 54, while the largest groups of girls were those who obtained marks between 25 and 44.

(*b*) Of the groups which obtained marks of 40 and over, the boys' groups were larger than the girls'.

(*c*) Of the groups which obtained marks of 39 and under, the girls' groups were larger than the boys'.

The distribution of marks given above was for one year only, but a similar distribution was found each year, so that again it seems evident that there is some difference between the boys and the girls.

The schools from which the candidates were presented were of three kinds—boys' schools, girls' schools, and mixed schools. It seemed well to find out what evidence could be obtained by calculating the average marks obtained by boys in boys' schools, by boys in mixed schools, girls in mixed schools, and by girls in girls' schools. For three successive years the results were as below.

Average mark of boys in boys' schools.	Average mark of boys in mixed schools.	Average mark of girls in mixed schools.	Average mark of girls in girls' schools.
44·0	41·9	34·25	39·9
39·8	40·9	34·4	38·9
42·5	42·8	35·0	41·1

It should be noted that the smallest group is that of the boys in boys' schools, so that the error is probably greater in this case than in that of the others. The range in the three years, even in this case, is only four marks, and in the others it is less. This gives some evidence of reliability.

In two years out of the three here quoted, the work of boys in mixed schools is the best, but it is closely followed by that of boys in boys' schools, and in the third year the work of boys in boys' schools is the best; there is indeed not much evidence from the figures before us as to which is the better. Both groups, however, in each of the three years are better than the girls in girls' schools by about two marks, while the girls in girls' schools are in turn about five marks better than the girls in mixed schools.

Accepting the results as representing facts these facts seem to be:

(*a*) The work of boys in geography in this examination is distinctly better than that of the girls.

(*b*) There is little evidence of a difference between the work of boys in boys' schools and the work of boys in mixed schools.

(*c*) The work of girls in girls' schools is slightly, but only slightly, below the work of boys.

(*d*) The work of girls in mixed schools taught along with the boys is very evidently worse than that of boys in the same classes.

This is perhaps the place to indicate that the differences in the work of boys and girls is not due to the personal equation of an examiner who has a dislike, conscious or unconscious, to the work of girls. There was certainly no conscious effect, and it is probable that the phenomenon is a real one, as it is supported by the results of other examiners who took part in the examination. Unfortunately, only the author found the average marks of the groups of candidates spoken of above. There is, however, another though somewhat rougher method of comparison to be made by taking the percentage of passes of the different groups.

In one year the results were as follows:—

	Percentage of passes of boys in boys' schools.	Percentage of passes of boys in mixed schools.	Percentage of passes of girls in mixed schools.	Percentage of passes of girls in girls' schools.
Examiner A	68	84	46	60
Examiner B	64	78	54	63

The conclusions reached above from examination of average marks of scripts, read by one examiner, are the same as might have been reached by an examination of the passes by either examiner A or by examiner B, except that the percentage of passes gives a strong presumption, which was only faintly suggested by the figures of average marks, that boys in mixed schools are rather better than boys in boys' schools. It may perhaps be further mentioned that after the author had ceased to take part in the work, the four groups of candidates continued under a different examiner to obtain percentages of passes which placed them in the same relative positions.

Looking back on what has been stated, it may now be said that the most important conclusion to be drawn either from figures for average marks, or from those giving the percentages of passes, is that the work of boys taught with girls in mixed schools is better than that of girls who have the same teaching. It seemed well to test this matter further. The work of mixed schools was examined more closely, and the average marks of boys and girls in individual classes were calculated and compared. The results for eight years are given on p. 314.

Year.	Number of classes in which the average mark of the boys was greater than the average mark of the girls.	Number of classes in which the average mark of the girls was greater than the average mark of the boys.
1911 . .	33	3
1912 . .	48	3
1913 . .	37	5
1914 . .	36	5
1915 . .	30	1
1916 . .	36	4
1917 . .	34	5
1918 . .	44	7

The difference is extraordinary and extraordinarily regular, and it should be noted also that the majority of the cases in which the average marks of the girls were greater than those of the boys, occurred in schools where the numbers of each were small.

Whatever the cause, it seems certain that in this examination in schools where boys and girls were taught together during the years named, the work of the boys was considered better than that of the girls. It may be well to notice the limitations, for it must be pointed out that the evidence does not prove that "girls cannot do geography," or even that "girls cannot do geography as well as boys," but simply that, as a matter of fact, the work done by the girls as tested by particular examination papers set by particular examiners was not considered by a particular examiner to be as good as that of the boys. One general conclusion to which we referred at the beginning of the chapter may indeed be drawn, that girls react to the teaching of geography, or to some forms of the presentation of geography, in a different way from that in which boys react.

If we are to obtain further light on the question, we must now remember some conditions which may or may not be relevant, and it must be clearly understood that while what has preceded is definite fact, what follows is largely speculation. One is that the syllabuses of the new geography have been drawn up almost entirely by men; the women who have been most successful at examinations have been those who best did this man's geography, for there has been no other. The teaching also to a considerable extent has been dominated by men, though there are probably more women teachers of geography now than there are men teachers. The same thing, of course, may be true of other subjects, but with that we have here no concern.

In view of the fact that boys and girls taught the same subject-matter by the same teacher differ so materially, it would seem that there are only three possible explanations:

1. Girls cannot do geography as well as boys.

2. The syllabus of geography which suits boys does not suit girls so well.

3. The teaching of geography which suits boys does not suit girls.

At present it is impossible to say how much weight should be given to each of these possible explanations. That the kind of geography taught, and that the way in which it is taught, are of importance is probable, if one remembers that only a few years ago before the days of the new geography, girls did do relatively better in examinations in the subject than in examinations for which figures have been given. Now we have seen that girls taught in girls' schools appear to do almost as well as boys taught in boys' schools. If the subject-matter which suits girls is not quite that which suits boys, it is probable that the difference is fully accounted for, so that it does not appear likely that the first suggested cause of difference that "girls cannot do geography as well as boys" is true. But it is evident that differences in reaction to the subject-matter can scarcely be the sole cause of the difference between the work sent in by boys in mixed schools and the work sent in by girls in mixed schools. Something of the order of a 2 per cent. difference may be accounted for by the difference in reaction to subject-matter, and there remains a further difference of the order of 5 per cent. This would seem to be due to reaction to teaching. It is, of course, possible that the difference between boys in boys' schools and girls in girls' schools may be at least partly due to differences in reaction to teaching. It is at least conceivable that the women who teach geography in girls' schools, while adjusting their methods somewhat to their pupils, still retain so much of what has been found successful in teaching boys, that it militates against complete success. In a mixed class it would be much more likely, especially if the teacher were a man, that more of those methods should be retained which prove successful with boys, so that girls do considerably worse. That only methods suited to boys are adopted in these cases is suggested by the fact that boys taught in mixed schools are certainly no worse than those taught in boys' schools.

With a view to finding out what modifications in the curriculum would be most likely to lead to satisfactory results, average marks given for the answers to individual questions in one examination paper were calculated for each of the four groups already mentioned. The results were not altogether easy to understand, partly because there was a good deal of choice in the questions attempted, and the number of candidates answering any one question was not always large enough to give really reliable results. It seemed, however, significant that the question which gave the lowest ratio of girls' marks to boys' marks was as follows: "The Suez Canal route to Australia is shorter than that by the Cape of Good Hope, and yet some ships use the latter route. Explain why this is so." On the other hand, the question on which the girls did most nearly as well as the boys (in no single question were they better) was as follows: "Write an essay on one of the following: (*a*) The British fishing industry; (*b*) the districts in Britain where dairy-farming is general; (*c*) the vineyards of France and Germany." There is a very distinct difference in the types to which these two questions belong; the one may be described as mathematico-economic, and the other as æsthetic-humane.

Finally, an expression of the likes and dislikes of boys and girls may be taken into account. This again goes to support the general conclusion that girls and boys react differently to geography as now taught. The number of those expressing their opinions was small, some thirty boys and some thirty girls of approximately the same ages as those whose answers have supplied the previous data. The boys expressed marked liking for having the "reasons of things" explained. Detailed statements seemed to show that the next most interesting work had been done in connection with "the work of people," with "map and section drawing," and with outdoor work generally. The subjects disliked by boys were stated to be "climate," "relief," and "manufactures" It was remarkable that nearly every girl included the word "people" in her statement, sometimes with the words "lives," "occupations," or "customs." In no case did the word occur which did occur in conjunction with "people" among the boys' "likes," namely "work." Instead there did occur a word with a rather different flavour, namely "occupation." The subject most commonly disliked by girls was called "contours." Others occurring repeatedly were "rainfall," "climate and what causes differences of climate," and "how mountains and valleys are made." The differences between the boys and the girls are obvious and rather significant. The "reasons for things" as we have seen occurs often among the boys' "likes," while the reasons for certain things are equally obviously disliked by girls. On the other hand, the humane side of geography appears to appeal to girls. There is thus very considerable agreement with the statistical work on questions answered best and worst by boys and girls. It would seem that while boys' work in geography may be more logical than that of girls, and the human interest may come later, girls are more interested in things—especially human things—as they are described to be, and may be less inclined to examine the reasons for them.

A strong case is made out for varying methods of presenting geography, and possibly even for varying the subject-matter presented, to boys and to girls, at least as far as the all-important detail is concerned. It would appear inadvisable to teach geography to boys and to girls in the same class, while it would also follow that girls should be taught by women and boys by men, even in co-educational schools.

It may not be out of place to point out that there is no evidence that girls cannot do geography; while the geographical roads by which boys and girls travel may be different, they may be directed towards the same goal—an understanding of the world as it now is.

For further evidence on this subject the paper on "Differences in the Geographical Work of Boys and Girls," by Miss E. W. Jones in *Geography*, March 1933, should be consulted. She reaches very much the same conclusions as here stated. She finds that as a matter of fact girls do not do so well in tests and examinations as do boys; that, though girls most nearly approach boys in reproduction of bookwork, an all-round weakness on the part of the girls is revealed in questions dealing with mapwork, descriptions, comparisons, climatic terms and the application of knowledge. But she says "We are not justified in assuming lack of ability merely from lack of achievement," and concludes that "a different angle of approach must be sought if the interests of girls are to be directed towards their geographical work."

A curious commentary on these conclusions is found in such books as Gertrude Emerson's *Voiceless India*, Isobel Hutchison's *Greenland's Closed Shore*, and Nora Waln's *House of Exile*, books which are not only delightful reading but which give an insight into the most intimate human geography which has been rarely equalled and probably never surpassed. But, to put it mildly, they are ill-served with maps!

CHAPTER XXI

THE SYLLABUS

We have already pointed out the importance of the teaching syllabus as distinct from the examination syllabus. In this chapter we shall consider in some detail the problem of planning the teaching syllabus.

If the reader has followed and agrees with the argument which has been presented, it will be obvious that the plan of the syllabus must take account of various matters.

1. The planning of a teaching syllabus is impossible unless the teacher has a philosophy of geography. He must know what it is all about; he must have a general aim in teaching the subject; he must know what it is for; he must know how it fits into its place in the curriculum. It is certain that there may be disagreement on details, and there may be different opinions even as to the function of geography in the school curriculum, but this is of comparatively little account from the point of view of teaching. It is not the teachers who have different views on the function of the subject who do not make satisfactory syllabuses, but those who have no views at all. The first necessity is that the teacher should know what he wants to do.

2. If geography is to be taught, it seems sufficiently obvious that somehow or other the syllabus must cover

the world. Otherwise what is taught is not GE-ography. Examinations at the leaving certificate stage are more and more recognising the importance of making the syllabus cover the world, but we are not concerned here with the examination syllabus. Even if there were no examination syllabus, we should still be morally compelled to make an attempt to give our pupils some idea of the world during the time they are at school, whether that school be a primary school, a central school, or a secondary school. Any plea for lightening the work by asking for something less than the world to be taken as the content of the syllabus is in effect asking that geography be not studied.

We have already seen that the world should be studied regionally. It is now implied that no region can be missed out. This does not, of course, mean that each region should have the same amount of emphasis ; this follows as a corollary from the principle that each region should be studied in the way which best brings out its character. Things should be seen in perspective. That things should be seen in perspective does not mean, however, as some examination syllabuses put it, that certain regions should be studied "in decreasing detail." As we have seen in Chapter XIX, details and concrete instances are always essential to good teaching, and if decreasing detail is taken to mean increasing generalisation (on insufficient data) we are merely getting back to the old geography which started with definitions. To teach geography in this way is neither scientific nor humane. Whatever is jettisoned, some detail must stand both as a basis for generalisation and in order to allow of understanding how people live.

3. Into the regional scheme of the world we must fit in, when the children are ready for them, the various facts and ideas which go to make up what is considered necessary or desirable of physical geography, of historical geography, and of economic geography. It may be thought desirable to take certain regions in one order rather than in another, so that a suitable scheme of physical geography or of historical geography may result.

4. Along with the regional scheme must also be taken a coherent course in map-work. The requirements of such a course may again make it desirable to study regions in a particular order. We have already directed attention to what seems a desirable course for the first year in which geography is systematically studied. The requirements of the map course here dominate the situation. One cannot start with such a course by " doing " South America or Asia, but one must start with the home area, and spread out from the home area to study Britain.

In addition to these four points to which we have referred, there are others which it is important to bear in mind in constructing a syllabus. No principle of general teaching application should be violated. We may take it as an axiom, for example, that we must proceed from the easily understood to the less easily understood, and that we can teach at any time only what children at that age can understand. It may be added that it seems pretty evident that the detailed teaching of geography to boys should differ from that to girls.

There is room for many different orders of presentation of the same material, but there must be some definite order and an advancing order, just as there is order in an arithmetic or a physics course. In far too many geography courses it would seem that the order in which regions or subjects were taken did not matter at all; judging by these courses it would appear that one can take region A in Form II and region B in Form VI, or region B in Form II and region A in Form VI with equal propriety, and teach them also in much the same way. This, of course, is nonsense. There is considerable latitude as to the order which may be adopted, but the order which is adopted must be adopted for some good reason, and just as one cannot in an algebra course teach the binomial theorem before there is some acquaintance with simpler ideas, so in geography there are some sequences which are impossible.

We may accept also the geographic axiom which at first sight seems to place us on the horns of a dilemma, that we cannot really know the homeland till we know the world because we have nothing with which to compare it, and that equally we cannot know the world till we know the homeland, for we have nothing by which to measure it.

As a matter of fact we do start with the homeland, but it is essential to notice that this study is bound to be incomplete, not only because all study of a region is bound to be incomplete since we can always learn more, but because we really do not know that homeland till we know some other parts of the world with which to contrast it. It is essential that the homeland should be studied again later.

The first year's course being concerned with the neighbourhood and with the homeland, it follows from our geographic axiom that the second year should be concerned with the world. The temptation at this stage is to attempt too much, to think that this, that, and the other *cannot* be omitted and *must* be introduced. One cannot too often remember that the pupils at this stage should not be asked to learn *all* about the world. Two aims one has: (*a*) to give a general idea of the relations of the great land-masses and of the names of particular parts; and (*b*) to give some idea of how people in some of those particular parts live, with such definite concrete geographical facts as children at this age can understand; but there should be no attempt to "do" the world. A third aim should perhaps be mentioned, to cover the syllabus in a year and not leave some part undone. It adds enormously to the value of the work and the pleasure taken in it if the pupils can feel that the work they set out to do is completed, apart altogether from the advantage to be obtained from rounding off the knowledge.

Then with some knowledge of the homeland and of the world, and with some knowledge of how people live in different parts of the homeland and of the world, the children are ready to begin to learn some geography.

The work of the first two years suggested above determines in a great measure the particular form of the later part of the syllabus. What is desirable and possible in a school in one set of conditions may be neither desirable nor possible in a school under different conditions. What is possible and desirable in a boys' school may not be possible or desirable in a girls' school. Thus each school is bound to have a syllabus different in details from any other, and even in general outline syllabuses may very well be different also.

The goal of geography teaching in different schools may very well be identical, and yet the roads to that goal may lie far apart. It is impossible therefore to present a syllabus and say that this is the best type of syllabus for all schools.

Schools are of various types, and while syllabuses of schools of different types may differ considerably, those of the same type tend to have some common characteristics of a general character though they may differ considerably in details. We shall by way of example consider the general outlines of a syllabus which might be suitable in the fairly common conditions of a municipal secondary school. This type provides, perhaps, the simplest case; one of the most important conditions is that boys and girls enter the school with junior scholarships at the age of eleven and stay for five years, taking an examination of leaving certificate standard, or of the standard of the first public examination, at the age of sixteen. The presence of these junior scholars is a most important factor; in the arrangement of the syllabus account must be taken of their presence. We can assume very little knowledge of geography on the part of these junior scholars, so that the syllabus of work during those five years must be self-contained as well as coherent. It must have a beginning, middle, and end. Let us then consider this five years' course, leaving for the present the question of how it may articulate with previous work.

It is necessary that the course should not be continually changing. This is inevitably the case when a changing special region is set in the first public examination at sixteen. A course which might lead up to the study of Europe as a special region would be very different from one that might lead up to the study of Asia. The order in which the continents were taken, let alone the methods of teaching them, would inevitably be different. It is partly because of the adverse effect of a changing special region that the world is increasingly being adopted as the subject of the examination; the other alternative, to have a fixed special region, equally inevitably leads to cram on the part of the schools in which the teaching is less good, and penalises the schools in which geography is well taught. The adoption of the world as the subject of examination leaves the teacher in a position of much greater freedom to employ the methods which seem best.

Taking this five years' course there are three main types of syllabus in regional geography, and many variations. The three types are differentiated according to which of two pairs of alternatives the teacher prefers.

(*a*) In the first year there is a choice between the British Isles and the world as a subject of study. Those who advocate the study of the world in the first year of the course do so on the ground that whatever the junior scholars have done, or have not done, they are supposed to have done the British Isles, and are usually "heartily sick of them." On the other hand, it is exceedingly rare to find a junior scholar who knows what ought to be known of the world at this stage. Those who prefer to take the British Isles first do so on the grounds that even if the junior scholars are supposed to have done the British Isles, they really know very little worth knowing, that it is essential to begin at the beginning and learn of the homeland before anything further afield is considered, and that, as a matter of fact, when the teaching of the British Isles in the secondary school is at all satisfactory, the children are *not* " sick of them," but much interested in their work. On the face of it there is little to choose between the arguments, but it may be added that even those who believe in taking the world first, usually believe that the British Isles should be studied in the second year.

(*b*) There is a further choice of taking the whole five years to complete the regional study of the world, with or without the preliminary world study in one year, or of completing the regional study of the world in four years, and leaving the fifth year to see what it all means and to study particular world problems. The first choice is made by those who say that it takes the whole time to " cover the syllabus," the second by those who say that the purpose of the syllabus is not fulfilled if the young people have not had time to grasp what that purpose is, and to see the world whole as well as in its several parts. The author confesses that he very strongly believes in the extraordinary value of this last " free " year. It may perhaps be pointed out, also, that as a few pupils leave at the end of the fourth year, it is an advantage to have had the course completed, however inadequately, by the time they leave.

We now see what the three types of syllabus are:

I.	II.	III.
British Isles, 1 year. Regions of the world, 3 years. World study, 1 year.	The world, 1 year. British Isles, 1 year. Regions of the world, 3 years.	The world, 1 year British Isles, 1 year. Regions of the world, 2 years. World study, 1 year.

In type I the second alternative under (*a*) is taken with the second under (*b*); in type II the first alternative under (*a*) is taken with the first under (*b*); in type III the first alternative under (*a*) is taken with the second under (*b*). There are obviously two other combinations obtained by taking the second alternative under (*a*) with the first under (*b*). This would mean either of the following schemes:—

British Isles, 1 year. The world, 1 year. Regions of the world, 3 years.	British Isles, 1 year. The world, 1 year. Regions of the world, 2 years. World study, 1 year.

These schemes do not seem to be so satisfactory as any of the others, and are, in fact, not accepted.

We have in the above schemes spoken of the regions of the world as taking "3 years" or "2 years." There must, of course, be some reason for the order in which these regions are studied. Obsessed by the mere spatial propinquity of the Continent, there has been a strong tendency to "do" Europe immediately after the British Isles. Europe, however, though the smallest of the continents, is certainly the most difficult. The physical geography of this continent, climatic, structural, orographical, or vegetational, is less easy to understand than that of any other continent; the modifications, even of the physical geography, by human agency are so considerable that difficulties are introduced which do not occur in the other continents, while the human relationships are so complex, and the historical geography so important, that Europe cannot be adequately studied till other parts of the world have been taken. Europe, therefore, comes last rather than first.

Regions where the physical geography is simple, and where the human response is obvious, are suitable for study at the beginning of the course, so long as they supply also sufficient contrast to appeal to the mind of the boys and girls. The geography of each of the three southern continents, South America, Africa, and Australia, is comparatively simple, and work with these three occupies about a year, so that they are sometimes chosen as the subjects of the first of the three years on the regions of the world. If Europe is dealt with in the last year there remains North America and Asia for the intermediate year. It may, however, be pointed out that South America, Africa, and Australia, while simple, are somewhat too much alike and supply a rather monotonous year's work at an age which is characterised by an intelligent curiosity about the things of the world. There are many resemblances, but few striking contrasts. Differences there are, but they are not such as to appeal to a boy or girl at this age, while the contrasts with Britain, which has presumably been studied in the preceding year, are too violent to make reference to Britain, and the consequent revision of the work on Britain, very satisfying. Further, there does not seem any very obvious reason, except that they are the *three southern* continents, why they should be taken together. Perhaps more important is the fact that, for reasons connected with the distribution of land and sea on the globe, the people of these continents have little to do with one another, and it is difficult to have any connecting thread running through the year's woik so that a story can be told.

It would seem better to have in each year regions which hang together in some way, but which have sufficient contrast between themselves to make teaching easy, and have also contrasts with the British Isles to ensure revision of what has been done. One arrangement of work which seems to have those advantages is that in which in each of the three years is taken one of the north-south sections of the world —the Americas, Asia and Australia, Europe and Africa. There is sufficient contrast within each year's work to ensure interest; in each year there are contrasts of physical conditions, and there are examples of societies in almost all stages of civilisation.

Other conditions also seem to be fulfilled. There is an increasing natural difficulty in each year's work. The essential physical geography and the human geography of the Americas are both fairly simple. The typical climatic scheme is fairly complete without being complicated. White settlement has taken place for so short a time that the historical factor, though important, is not too overwhelming, while the native peoples are fewer in numbers than anywhere else on the globe.

In Asia and Australia the physical geography and the human geography are more complex than in the Americas. The climatic regime is different and entails a survey of world conditions. If it is deemed well to refer to pressure, it is obvious that the barometer must somehow or other have had some attention; this attention is more likely to have been given by the second year than by the first. The greater facts of relief and structure have also a world significance. The relations of men and societies to the physical conditions are more subtle; there are in Asia peoples of old civilisation which have gradually come to be what they are, and at every stage have greatly modified their surroundings. The ways of life of those peoples are, too, very different from those in the Americas. There are strong contrasts between the peoples of Asia and those of Australia. There are contrasts with and similarities to the conditions and the modes of life studied in both the preceding years, which at once give opportunities for revision and for learning something more of the geography of these lands than was possible at the times when they were studied.

Europe and Africa are left for the last year of the three. There is contrast enough within the year's work to give scope for revision of what has been done previously. Climatically and structurally Europe can be understood very much better if it is studied after the other continents have provided a setting, while the study of human relationships in the other continents has prepared the way for the understanding of more complex relationships, both in Europe and in Africa. Both historical geography and political geography have in Europe a most important place.

The importance of planning for revision must here be insisted on. No experienced teacher will deny for a moment the importance of revision, but much geography revision is done in an unsatisfactory way. It may be taken for granted that if revision means that work which has been done once is done again in precisely the same way, then the probability is that there is something radically wrong. On occasions such procedure is legitimate and necessary. When one learns the multiplication table, it has just got to be learned; it must be revised till it is known. A good deal of the revision must be done again and again in the same way, but even in learning the multiplication table there are possibilities of varying the work to some extent, and when the children are revising mathematical processes it is not usual for them to work out exactly the same examples. The conditions in geography and in arithmetic are not precisely the same, but the principle is valid. If the teacher wishes to make sure that a boy knows certain definite geographical facts, it is the business of the teacher to bring those facts before the boy in as many different ways as possible. If he wishes to give richness to an idea, he must present that idea in as many different settings as possible.

This principle is accepted as far as individual lessons are concerned, and its practice leads to good results. In a lesson to a class of some thirty boys on the Hudson-Mohawk gap, some twenty-five names occurred. Some of them were mentioned only once, others were introduced again and again, but whenever each was mentioned, whether once or oftener, some idea was connected with it. Otherwise no special emphasis was given to each name. Some days later a sketch map of the Hudson-Mohawk gap was put on the blackboard, and numbers were written in place of the names which had been mentioned in the lesson. The boys were given slips of paper and told to write the numbers 1 to 25 below one another, and opposite them the names of the places to which they referred. Every boy got 50 per cent. of his identifications correct and a considerable number of boys got 75 per cent. correct. When a similar experiment was made with another class after an attempt had been made to *teach* the names, the results were not so good. It would appear that constant revision by which things are presented from a different point of view each time is more effective than mere reiteration.

But though the method of revision is accepted as far as a particular lesson is concerned, it is not usually acted on when a year's work is revised. It is the absence of the continual revision carried on by presenting old facts in a new light which makes so much geography work feeble and ineffective, and which is the original cause why so many teachers plead for a reduction of work for the public examination taken at sixteen or seventeen. It is bad enough when such people think of an examination taking place only on what may be "got into" a year's revision in which all that has been "done" in previous years is gone over quickly in the same way again; it is worse when they think of the examination taking place on the last year's work only.

If the third scheme is adopted, and the regions of the world have to be taught in two years instead of three, the fundamental considerations remain the same though the problem is much more difficult. Europe will certainly be taken last, and the early work will be as simple and direct as possible.

If the whole work is compressed into four years instead of five, as is unfortunately or unwisely the case in some schools, the problem of taking the regions of the world in two years will pretty certainly have to be faced.

The chief types of possibilities seem to be as follows:—

I.	II.	III.
British Isles, 1 year. Regions of the world, 3 years.	British Isles, 1 year. Regions of the world, 2 years. World study, 1 year.	World study, 1 year. British Isles, 1 year. Regions of the world, 2 years.

In view of what has been said of the five years' course there is no need to comment on these possibilities.

The problem of the syllabus is complicated by the necessity for using a text-book. It is not necessary here to discuss the use which may be made of text-books; we may take it for granted that they must be used, and point out that it is this necessity which compels us at present to think of a year's work in terms of continents, because the text-books are built on continents. It is more than possible that the ideal syllabus might deal with the regions of the world in an order other than continental. If one is prepared to sacrifice text-books, the syllabus possibilities are enormously extended, but just because the text-book is a necessity, at least in the upper school, and because the possibilities are so extended if the text-book is not used, it is not worth while to go into further details. Whatever the syllabus the same principles hold.

So far we have omitted the consideration of one very important point. The municipal secondary school with a five years' course offers perhaps the most straightforward type of syllabus. If there is a junior school with children younger than eleven, there is, however, one almost insuperable difficulty. In such a junior school geography can usually be taught systematically for three years. We have discussed the work of the first two years. It is the third year, that immediately preceding the entry of the junior scholars, which presents the difficulty. Here there is a choice of two evils. We may arrange for a year's coherent work to follow that of which we have already spoken. The children are ready for it; they are prepared to be interested, and quite good work may be done at this stage. If, however, good work is done, there is extraordinary disparity in the following year between the junior scholars and the pupils who have been in the school. There may also be some difficulty in choosing a suitable region for study in view of the requirements of a self-contained five years' course to follow, but this is not the real difficulty, which is, that the geographical outlook of the children taught from the beginning in the school is so much broader, that they know more both of facts and ideas than the junior scholars, and are positively bored when the work they know is being taught to the junior scholars in the same class. The alternative seems to be to mark time deliberately for a year; this is not only unsatisfactory, but difficult. The difficulties of progressive work are, however, so considerable that one must seriously consider the possibility. In any case here is a problem which is not yet satisfactorily solved.

If the problem of the secondary school is difficult, the problem of the primary school is very much worse. The chief difficulty arises from the fact that the children leave school just at the age when they are beginning to understand something of the real meaning of geography ; it makes all the difference in the world to a boy or girl in the understanding of geography, as of much else, whether he or she leaves school at fourteen or sixteen.

The course for the first two years is inevitable ; there need be no difference in any type of school ; the syllabus of work already outlined for these first two years is meant to apply to primary schools as well as to secondary. The third year almost inevitably deals with the British Isles in regions. In the first year's course the British Isles have been studied from the point of view of the district in which the school is situated ; now there is some possibility of dealing with each region in a little detail.

There remains a further question ; we have not yet determined in what standard the first year of systematic geography should begin. Standard I is out of the question ; stories with a geographical background are entirely suitable, but systematic geography even of the home area, and still less of other lands, is not to be thought of. In the case of many, perhaps most, of the classes labelled Standard II the same may be said, though it is quite possible for the rest to work through the first year's course. Standard III seems, on the whole, the most suitable class with which to start. If we start with Standard III the first three years of the course[1] will then be :

Standard III.—First year's course.
Standard IV.—The world.
Standard V.—The British Isles.

[1] In all that is said, it is assumed that there are no undue promotions. As the author knows, this is an unwarranted assumption, but the question of a syllabus can be considered only on this assumption.

In the planning of the syllabus further facts must be taken into account. It is unfortunate that by no means all pupils in primary schools reach Standard VII before they leave. This places us in a dilemma; the geography of Europe is inherently difficult, and however we may try to simplify it some difficulty remains, so that it is desirable to take the study of Europe as late as possible. On the other hand, it is most desirable that as many children as possible should know *something* of the geography of Europe before they leave school. It is most unsatisfactory to have to study the geography of Europe before that of any of the other continents, but it is equally bad that boys and girls should leave school knowing only so much of the geography of Europe as may be gathered from the preliminary course on the world. If there is a special class into which all pupils pass before they leave school, Europe might very well be considered as a subject for such a class. Otherwise the decision must depend on the circumstances of individual schools. If a good proportion of the pupils, who are not transferred to other schools, remain till they reach Standard VII, then Europe may very well be kept as late as possible.

A possible solution, though it is very far from being an ideal one, is to study the Americas in the first six months of the Standard VI year, and Europe in the second six months, leaving a general study of the Old World till Standard VII. If most of the boys and girls stay till Standard VII, then it might be worth while to put the Old World into the second semester, to use a transatlantic term, of Standard VI, and take Europe in Standard VII along with general world geography.

If geography can be begun in Standard II, the problem is somewhat easier, though still difficult. Our course would then run :

Standard II.—First year's course.
Standard III.—The world.
Standard IV.—The British Isles.
Standard V.—The Americas.

The scheme may then be completed in any of the following ways :—

Standard VI .	The Old World.	Europe.	The Old World, Europe.
Standard VII .	Europe.	The Old World.	Revision work.

It may perhaps be suggested that a possible course would be to omit the world after the first year's course, so that the scheme would be :

Standard II.—First year's course.
Standard III.—The British Isles.
Standard IV.—The Americas.
Standard V.—The Old World.
Standard VI.—Europe.
Standard VII.—The World.

This procedure is very tempting. The latter part of the work seems to be greatly improved. As a matter of fact, however, the earlier and in a sense the more important part of the syllabus is here most unsatisfactory. In effect the British Isles comes immediately after the " First Year," which very largely deals with the same region; the absence of a course on the world makes subsequent work difficult, and, more important than either of these facts, the children are still too young in Standard III to understand the regional geography of Britain which they are supposed to learn. From the very fact that they have started geography in Standard II, they are supposed to be above the average, but that does not mean that they can do in Standard III what it is more natural to do in Standard IV, or even V. The "regional geography" of Britain which can be done in Standard III is not worth the time spent on it. The children may learn something out of a book, but they cannot appreciate the real facts.

We have now considered the chief possibilities in a primary school if one thinks in terms of continents. In a primary school as, perhaps more than, in a secondary school it would be well if one could divide up the work rather differently. In one respect it is certainly easier to do this in a primary school than in a secondary school. The tradition of the former for the last generation has been to depend on oral work in geography, and there is little of the dependence on the text-book which determines courses in the latter. Theoretically in a primary school it is possible to take any region small or large in any sequence one pleases. The absence of the text-book is, however, a source of weakness rather than an advantage; no teaching in any type of school is at all adequate without a text-book. Indeed, it may be said that the non-use of the text-book in primary schools is second only to uneducational promotions in making the teaching of geography, as of other subjects, of so little effect. The dearth of suitable text-books, graded in difficulty according to a coherent plan, is more greatly felt in the primary than in the secondary school, and this greatly limits the possibilities of the construction of serious schemes of study.

Of geographical work for advanced courses little need be said. These should be in the hands of teachers of experience who are capable of solving for themselves the problems involved. Moreover, advanced courses in geography are of such recent date that we have scarcely had sufficient time to come to an understanding of what is best to be done. On this, however, there is general agreement; the work must remain scientific and humane, otherwise it is not geography; the importance of the past, physical and historical, must be emphasised; there should be regional study of the globe, of a large region, or perhaps two large regions of contrasted development, and a small region, the latter being studied if possible on the spot, and certainly from original sources. All that has been learned previously will be utilised; ability to draw, to tackle problems, to read maps, to use original material, to understand home geography, and specially to think geographically will be used and extended.

CHAPTER XXII

ORGANISATION OF A YEAR'S WORK

IN the last chapter we have discussed the considerations which must be taken into account in planning syllabuses in schools, and have given examples of schemes of work which to a greater or less extent conform to the principles laid down. It is of fundamental importance that the general scheme of work should be carefully thought out. But success in teaching depends on the utilisation of the time at one's disposal, and in practice this means that an experienced teacher plans a year's work in terms of individual lessons.

In this chapter we propose to give indications of the ways in which the problem of organising the year's work is attacked. Teaching is successful in proportion to the amount of care which is taken in organising the work and in seeing that each portion is done well. To revert to the metaphor of the motor-car (p. 106), the running of the completed car depends not only on the design being good, but on the workman-like production of the separate parts. The teacher's business is to plan the construction of the units of the syllabus, just as the manufacturer plans the construction of the units of the motor-cars, and just as a car may fail not through the general design being faulty, but through the inadequate design of some of the smaller parts, so teaching may fail not because the general syllabus is wrong, but because the details of a particular year's work are unsatisfactory.

A course is most successful, especially with lower classes, when each lesson is a unity in which something definite is done or in which a particular problem is solved. Each lesson, in fact, is an artistic whole. The points of such lessons are more easily made and their effects are longer felt. If each two lessons or three lessons can be combined in some way, the possibilities of success are increased.

Let us now apply these general considerations to the case of the preliminary course on the world. In this course, as we have said on p. 324, the aim is not to learn all about the world, but (1) to give a general idea of the relation of the great land-masses and of the names of their particular parts, and (2) to give some idea of how people in some of those particular parts live. We have a certain definite small number of lessons in which to do this. Those lessons must be coherent and progressive. The number of weeks in the school year is about forty, but when allowance is made for accidental dropping of lessons by reason of necessities for revision, examinations, ceremonies of one kind and another, odd holidays and other mischances, it is not safe to reckon on more than thirty teaching weeks, and probably this is an overestimate. If we have only one lesson a week, this means that we have only about thirty lessons in which to cover work on the world. Most schools would, however, have two periods, so we might count on sixty lessons. The arrangement will depend to a considerable extent on what regions we take first, for other things being equal the earlier lessons will take longer to cover a given amount of ground than will the later ones. If we take the New World first, something under thirty periods (out of sixty) might perhaps be given to the New World, and something over thirty to the Old World. On the other hand, if we were to take the Old World first, then we might easily take two-thirds of the whole number of lessons to the Old World and only one-third to the New.

Let us start with the New World. How shall we proceed? By taking related topics and talking about them we may deal with certain areas or certain aspects of geography. We shall select those topics so that, as a matter of fact, the areas and aspects of geography which we wish to cover are actually covered. In selecting the topics we shall also keep in view the capacities and interests of the children. For example, a succession of lessons on "The Emigrant," "The Wheat Farmer of the Prairies," "The Indians of the Plains," "The Cotton Grower of the South," "The Lumberman of the Forest," "The Fur-trader," "The Highlands of the West," may be so given as cover fairly adequately the essential geography of North America. By no means everything will come in, but little that is of fundamental importance will be omitted. The story of the emigrant starting from Liverpool, and proceeding to a farm in the wheat-belt, will introduce the distance across the Atlantic in a satisfactory setting, with stories perhaps of life on board ship; the arrival at New York, with the reasons for the fact that the great majority of vessels do go to New York, will introduce a reference in its natural setting to the whole of the relief of the eastern seaboard without the necessity of going into any details, except the important details relating to the country to the west of New York. The coldness of the north in winter and the consequent impossibility of utilising either the Hudson Bay route or the St Lawrence route for a greater or less part of the year, will also come in, while the actual shortness of the route by Hudson Bay and the effects of the rotundity of the earth must be referred to. The important facts of the geography are not arranged, perhaps, in a logical order, but they are organically part of the "lesson," their importance is seen, and they stand a far better chance of being remembered and valued than if they had simply been learned in the grammatical order.

If the route to the prairies has been traced in the first lesson or pair of lessons, the natural sequence suggests that the next lesson or two might deal with the wheat farmer. Here the general geographical conditions of a region are considered from the definite detailed point of view of one person or one family, and the claims of generalisation and particularisation are harmonised. The story may be continued by pointing out in what ways the wheat that is grown in Canada may be sent to Britain, and by so doing the work covered in the first lesson or lessons is revised and expanded. Proceeding in this way and taking a definite topic for each lesson, that topic may be utilised to revise what has been done before and to develop the whole scheme still further.

Following on the lessons already suggested for North America, we might have others dealing with Columbus and the West Indies. This may perhaps be the place to point out in what circumstances stories of explorers and pioneers are useful in geography teaching. If the facts, both generalisations and details, that are brought out by the stories are of present-day importance, these stories may be used; if, on the other hand, the stories are concerned with conditions which have entirely passed away, with irrelevant detail or with false starts and misunderstandings because the pioneers could not see the wood for the trees, then such stories are of little use in geography teaching, and may indeed be positively harmful. One could not teach the geography of Britain by means of the accounts of Cæsar's explorations.

Now the facts which are to be noted in the Columbus narrative all fulfil the positive conditions. The importance of the trade winds and the westerlies is a fundamental note in the whole story; even the incident of the mutiny, because the former were so persistent, is of great value as a teaching point. The distinctive conditions in the West Indies brought out by the story have not greatly changed since the time of Columbus. The type of civilisation has changed, but the emphasis in the account as usually told is not laid on the people whom the Spaniards saw, and little need be said about them, while the emphasis is laid on things of permanent importance, such as the islands and the vegetation of the islands. The whole story is therefore of value.

Following on Columbus and the West Indies, we may select topics which introduce different regions of South America, in which as opportunity offers comparison is made with regions already studied, and contrasts are pointed out. But lest it may be thought that here we suggest that there is only one way of attacking the world problem, it may be useful to outline another method of beginning the course. We shall still start with the New World.

Our first lesson may be concerned with the story of Drake's voyage round the world. Sooner or later one must face the problem of the roundness of the world. Few adults really feel or believe it. There are many intellectual proofs given in the books; the evidence of the shadow of the earth on the moon, and the disappearing ship at sea, are perhaps the commonest, but they scarcely carry conviction. The argument which probably has most effect on children in inducing a working belief in the roundness of the globe, is that given by the journey of some friend or relation round the world. Failing this, the next most effective argument is to tell the story of Drake by the aid of a globe—a blackboard globe for preference. The story will be told, but the plain unadorned fact that Drake sailed round the world is all that need be left with the children; there should be no statement in the lesson that the world is round. The story of Drake will also define the general situation of the continents and oceans, and the emphasis will be on the bigness of things as compared with those which have been studied in the previous year, and the work of that year will supply some scale by which to measure the continents. The wind systems which helped or hindered the sailors will naturally fit in to their places in the story.

Naturally, also, reference will be made to such happenings as are valuable for our geographical purposes. Much will necessarily have to be cut out. In attempting to make a map of Drake's voyage from the globe, the children will meet the problem of how to represent a spherical surface on the flat, and may be left for the present with the belief that this cannot be done. As a makeshift, a map of the voyage may be made in sections. One of those sections will be of the seas round South America. It is natural that we should then proceed to study South America.

One considerable advantage of this beginning is that the necessary map-work is easy. The Amazon forest might be the first topic, and the map-work necessary for the insertion of the Amazon forest on a map of South America is very simple. Further topics can be selected to cover the continent and then North America, but after what has been said above, it is not worth while to go into further detail.

It may, however, be useful to consider the treatment of Africa, so as to illustrate other teaching points. It would be possible to take Africa before the Americas, but probably it is better to deal with that continent after the New World has been studied. To begin with, it is most satisfactorily approached from the point of view of a traveller from other lands, as indeed all lands but the homeland should be approached. The voyages of the Portuguese navigators supply the material. Revision can be made of the wind systems, and correspondences with the Americas suggested. Distances can be emphasised by noting the time it took to explore the west coast of Africa.

The drama of the voyage of Diaz should be insisted on, though technically it may not be geography. For a hundred years navigators had been sailing farther and farther along the west coast of Africa, having land always on their left hand as they sailed south. In the hundred years of exploration they had become accustomed to the idea that whether in sight or not the land was always there. It is interesting to speculate on the excitement and perhaps even bewilderment on board the vessel of Diaz when, after the storm which they experienced, they again turned towards the land—and found none there. One can imagine the anxious inquiries of the look-out man, and then the order given to sail *north* and find where the land really was.

If the children are asked to make a map of Africa

FIG. 46.

FIG. 47

to show the voyage of Diaz, as they very well may be, the map they should draw should show only the west coast as in fig. 46. This is all that is known as far as Diaz is concerned, but that is not the only reason for the omission of the rest. The real reason for the omission is that the children have not learned any more, and there is no reason why they should draw a map to show any more. To increase the area known the voyages of Da Gama to India may be taken. Now the map may be extended as in fig. 47. Notice again, however, that the whole Mediterranean and Red Sea coast is omitted, while India stands isolated, as in fact it did to those voyagers. To complete the coast-line modern voyages must be taken which use the Suez Canal route.

Then the children are ready to attack the geography of the interior of Africa. "The pygmy of the forest," "the negro of the grass-lands," and "the Arab of the desert" will serve as topics by means of which the equatorial forest, the savannas, and the desert may successively be fitted into their places on the continent, and comparisons made with lands already studied. When these areas are known, it is easy to deal with the rest.

Sufficient indication has now been given of the way in which the construction of the course of work on the world should be approached, and there is no point in giving a syllabus of the rest of the continents in detail, especially as it is only the method of approach which is being suggested, and there must be many ways of constructing a syllabus on these lines. It will, however, be obvious that by proceeding in this way a conception of the world, as a whole, may be built up in the course of a year's work.

Let us now take as an example of more advanced work a scheme of teaching the geography of Asia to a class in the upper school. Here the organisation of the work will be somewhat more complex, for it is not only legitimate but desirable that the lessons should be taken in groups, each of which may technically be called a method-unit. In the work of lower classes the physical geography is scarcely distinguishable from the rest, but here individual lessons may quite well be devoted to physical facts as they are illustrated in particular regions. It may be assumed that at this stage the distinctive features of the geography of

Asia will be emphasised, and the effect of Asia on the physical geography of the world will be noticed. In particular the subjects of the heating and cooling of the land, of the monsoon systems of wind, and of the pivotal position of Asia in the morphology of the world, if one may mix metaphors, are almost of necessity considered. Pressure, if that thorny subject is to be taught, will pretty certainly be taken in the light, or darkness, of what is considered to be the pressure system over Asia. The following notes indicate a possible procedure. It may be pointed out that the general physical ideas are based on the particular physical facts evident in the geography of the continent studied, and in turn build up a more and more precise idea of the geography of that continent. It will be necessary to give only the subjects of the lessons, and it will be understood that much cross reference and revision will certainly be necessary.

1. Greater warmth of the equatorial regions than the polar regions; vertical and inclined insolation, sphericity of the earth, different effective thicknesses of atmosphere (reference to the distribution of the atmosphere and the size of the earth).

2. "Iso-sunrise" lines over Britain from sunrise figures for Yarmouth, Greenwich, Wick, and Valencia. Day and night.

3. Effect of position and attitude of the earth on temperature variation. (*a*) Summer warmer than winter: (i) space covered by insolation ray in summer and in winter; (ii) atmosphere penetrated by insolation ray in summer and in winter at midday; (iii) length of day in summer and in winter. (*b*) Insolation at different latitudes on 21st June.

4. Duration of daylight at Greenwich and Wick, equation of time as a fact (no explanations).

5. Effect of position and attitude of the earth in defining the tropics, the Arctic and Antarctic circles.

(i)	when	ecliptic-equator	angle is	$23\frac{1}{2}^\circ$.
(ii)	"	"	"	30°.
(iii)	"	"	"	45°.
(iv)	"	"	"	60°.

6. Decrease of temperature upward, adiabatic expansion, high ground colder than low, " reduction " to sea-level (examples from Asia).

7. Temperatures over Europe, Asia, and N. Africa, summer.

8. Temperatures over Europe, Asia, and N. Africa, winter.

9. Winds and surface pressure over Southern Hemisphere, January (without reasons).

10. Winds and surface pressures over Southern Hemisphere, July (without reasons).

[10*a*. Explanation of world pressure and resultant winds, Ferrel's Law.

10*b*. Isobars and cyclones (cyclones studied as wind systems from plottings of winds will have been done earlier, probably in connection with Britain).]

11. Currents of Atlantic and Pacific, drift currents and stream currents, relation to prevailing winds.

12. Temperature of Southern Hemisphere in January and July, effect of currents in modifying normal temperature distribution.

13. Winds over Euro-Asia and N. Africa, winter.

14. Winds over Euro-Asia and N. Africa, summer.

15. Causes of rainfall.

16. Rain over Asia, winter.
17. Rain over Asia, summer.
18. General survey of the relief of the world, Atlantic structure, Pacific structure, relief of Asia.

Having considered the setting of the continent and its general geography, the several parts, each with its special characteristics, may very well be studied. A number of lessons, varying with the importance of the region, will be given to each area, but will be so organised that the individual character of the region may be brought out. The Siberian Plain may be studied in relation to vegetation; the Land of the Five Seas as a transition region, but specially in connection with communications; India and China as contrasted types of old civilisations, the diversity of human life in India being contrasted with the similarities all over China; Indo-China as a transition region of settlement rather than of movement. Japan and the Tarim Basin may very well at this stage be taken as more or less complete examples of the geographical argument. It is also possible to take particular aspects of the continent as a whole while studying one or other of those specific areas. Thus it would be quite possible to extend the discussion of the natural and human regions into which the plain might be divided to a discussion of the natural regions, climatic or vegetational, and the human regions into which Asia as a whole might be divided. Occasion will, of course, also be taken to extend mapping exercises. Thus some of the products of India may be mapped from statistics. A little of this kind of work will have been done in previous years, and incidentally a little of this work goes a long way. But India presents special difficulties in that there are no statistics for a considerable area of India, and the problem is one that must be solved somehow or another. It is not necessary that all the class should map the same product. Three or four of the most important may be mapped by different sections of the class, and the results compared. Thus the standard of work is in all respects suited to boys and girls in the upper school who have had a good previous training, and presupposes that training.

Having outlined courses at different stages in the earlier years of the course, let us now say a very few words about the course on "World study" in the fifth year. Of this it is difficult to give details, for a great part of the value of the course lies in the freedom it affords in pulling together what has been done before and supplementing deficiencies. What is done in any particular fifth year depends on what has been done in the previous years, and specially on what have been the deficiencies.

Britain will certainly be revised. This revision may possibly be based on an intimate study, which may take up some weeks, of the home region by means of ordnance maps, rainfall maps, geological maps, statistics and any information and maps which in fact may be available. It may be pointed out that even boys who imagine that section drawing is mechanical and easy may find that some thought must be given to the drawing to true scale of a section of a 1-inch Ordnance map showing slightly undulating country where there are considerable areas without any contour lines.

This is probably the year also when map-nets may be conveniently studied, if they are to be studied at all, in connection with work on latitude and longitude. Indeed, the whole question of methods of mapping may be discussed. In this connection it is extremely interesting to utilise the curve of midday altitudes of the sun found for a year by pupils in a lower form of the school, and hence determine (i) the latitude of the school; (ii) the angle between the ecliptic and the equator; (iii) the correction for declination at stated times of the year, say, the first of each month.

It may, however, be suggested that whatever is done or not done in this year, the special emphasis should be laid on the world as a whole, and the unity of the world insisted on. This is the time for generalisations on such data as have been acquired in the previous years of the course. Definitions and generalisations are often introduced at the beginning of the geography course and are there quite out of place. Here, at the end of what is for most pupils their study of geography in school, generalisations of some kind are entirely in place. The amount of generalisation will, of course, depend on the amount of knowledge.

The world has to be "done" somehow in this year. The relative importance of different natural regions and human regions may now be emphasised, and in this way the world be revised and seen to fit together as a whole.

Another method of revising the world which has in practice been tested and found useful is to take a particular important product such as wool, meat, wheat, cotton, or timber, and let the boys and girls work at it for some six weeks in order to find out the facts for themselves. Ordinary text-books will be consulted, but it is not these which really supply the information; rather the aim is to see to what extent statements of text-books may be trusted. The *Statesman's Year-Book* and *Statistical Abstracts* should be available and a few other reference books, though it is as well not to have too large a number, as even at this stage the pupils would be confused. There should be no formal "lessons," but the teacher would always be available for consultation and to give advice.

It is possible that at first the boys (and girls) may be rather at a loss, but this stage does not last long, and very shortly the fascination of finding out things for themselves takes hold of all of them, especially if they have had some little training in previous years, and they are soon busy devising a plan of attack. There are many difficulties. In the statistics there are many blanks and inconsistencies. Available figures are given in different forms and for different dates, *e.g.* the value of the wool exported may be given for one country, the value of the clip for another, the number of sheep for a third; a fourth will state the weight of the wool clip "in the grease," and immediately one wonders what relationship this has with other figures. All these difficulties must be faced and some conclusion reached. The experience gained is extremely valuable.

Then follows the construction of maps and diagrams, and, finally, there is the production of some kind of report. These reports will vary in inherent value and nothing much can be expected from any of them, but however they differ the writers will have obtained a great deal of good from the work they have done. Six weeks is a compromise between the time which might be spent on the work and the time which can be spared for it.

The advantages of this work are numerous.

1. In the course of it a good deal of reading will have been done *for a purpose*.

2. The value, use, and limitations of statistics will be learned.

3. In the course of the work the pupils utilise a vast amount of the knowledge which they have acquired previously, and in so doing they make it much more their own. They also obtain a great deal more information which fits into a scheme, but perhaps the chief advantage is that the world has to be thought of as a whole if a suitable subject has been chosen.

4. Methods and ideas learned in previous years may be utilised; indeed, little can be done unless they are used; such work as this can scarcely be done at all if the previous training has not been satisfactory. It is in fact a test of the worth of the course.

5. Most important of all there is a feeling of reality about it all. The pupils, students rather, are not merely assimilating what other people tell them of things in which they do not more than half believe, but they are finding out things for themselves on a sufficient scale to make the work worth doing. Such work at the conclusion of the course leaves a good impression of the whole, and makes it the more likely that it will be useful in after life.

Here, then, we conclude with the assurance that the aims with which we started our course have not altogether been unfulfilled. Working through a carefully graded course, helped by such aids as the schools may supply, and taught to use these aids and yet avoid the many pitfalls that lie in his way, the future citizen will have been trained in his geographical work to imagine something of the problems of this confusing and contradictory world, and to see at least in some things a semblance of order. This surely makes worth while the teaching of geography in school.

CHAPTER XXIII

ENVOI: CAN WE TEACH GEOGRAPHY BETTER

(Being the Presidential Address to the Geographical Association, January 1936)

In the following I shall speak of teaching and the teaching of geography—the technique of teaching, not the aims—and say why I think that we may teach geography more effectively.

In these later years I have been more and more conscious that what I have said both by word of mouth and in print, though true, was only part of the truth. Many statements about the teaching of geography really gain force when it is seen that they are merely applications of very general teaching principles. I propose, therefore, to deal with fundamental teaching principles, axioms to speak mathematically, and indicate how they may improve our teaching of geography.

These teaching principles are not new (how could they be?), but they have supplied very little real inspiration in the past because they have rarely been applied to particular subjects and particular cases.

The fundamental teaching [1] maxim, which sums up all the technique of practical teaching of every kind from infancy to the university stage and beyond, is

[1] In what follows "teach" is used to mean that the teacher is the active person; when it is used in a wider sense the context makes it plain.

"Put people into situations so that they learn," "Experience does it," and the best teacher is the man or woman who puts his or her pupils into such situations that they learn most of the best things in the shortest time.

The maxim is certainly true in the first months or years of life. You cannot teach an infant of three months to grasp anything; you can only give him opportunities of grasping things; you would be foolish if you said "put out your hand, place your palm against the object, now bend the fingers," and so on. You cannot teach an older child to walk or talk; you do not ask his mother if she has taught him to walk or talk, but "is he walking yet?" or "is she talking yet?" Nursery schools and infant schools are making enormous strides because of their recognition of the fact that, if they provide the situations, the youngster does the rest.

The same principle holds in dealing with older children; we think that we can take short-cuts by telling people and attempting to teach them, but we cannot. As was said at a Geographical Association Conference a good many years ago, "No boy likes to be taught, every boy likes to learn." In this case, as in many others, the longest way round is the shortest way home, and from the actions of babes and sucklings we may learn much teaching wisdom.

In the first place, however, let us begin even nearer home. There is one situation into which we might put ourselves which would help teaching and the teaching of geography enormously. I wonder how many lessons, since you started teaching, you have seen other people give, and how many lessons other people have seen you give. I do not really wonder. I know that the answer is "very few." There is no other job in the world that is practised so secretively. Most teachers would sooner part with all their garments than expose their teaching to their colleagues.

In fact we do not have the pride of achievement in our job of teaching that others have in their jobs. The gardener, who also has to do with growing things, says to his friends "come round and look at my roses or tomatoes or potatoes," but though we may say "look at my examination results" we do not say "come and see how my IVth form are getting on."

If teachers of geography changed all this and placed themselves in situations such that they would receive expert criticism on their work, brilliant methods, which no one ever hears of, would have a chance of being copied; bad methods would have a chance of receiving condemnation. Teachers occasionally obtain leave to visit other schools and see someone else teach geography, "by the new methods" as the phrase is, but this business of seeing lessons begins at home, as does so much else; if you cannot learn something about the teaching of geography from seeing a good arithmetic lesson, or even a bad one, in your own school, you must be a very good teacher indeed, or incompetent. What we wish to learn is not only not to talk shop, which almost always excludes actual methods of teaching, *out* of school, but to have professional, critical, impersonal discussions of methods of taking particular lessons which our colleagues have seen *in* school.

When we do not use the opportunities which we have, it is no use crying out because we cannot go round other schools seeing how geography is taught in these; but of course we ought to do that also, it is one of the situations that ought to be changed. Nor ought we to see only schools of our own class. Teachers in junior schools, not to speak of others, ought to know what is going on in the infants' department (and incidentally may I say that they would probably learn a great deal about teaching); but how many do, even when it is in the same building? The central and secondary schoolmaster or mistress ought to know what geography is being taught in each contributory school; but again how many do? And teachers in contributory schools ought to see how geography is taught in the schools to which their pupils go. We need constructive criticism by our equals. Criticism by our pupils, though it might be even more salutary, rarely reaches our ears.

When we apply this fundamental teaching maxim to our relations with our pupils we note that one of its implications is that the pupil should wish to learn what we wish him to learn; the emphasis is on the activity of the pupil, not on the activity of the teacher; learning is active, being taught is passive.

Learning is, in fact, a natural growth, whether at six days, or six months, or six years, or sixteen years, or sixty years, and the situations in which people learn most and fastest are natural situations. Of course, in unnatural situations the children learn, but not usually the things that the teacher thinks that he is teaching; instead of learning the products of Patagonia, or the relief of New Zealand, or where the 64° F. sea-level isotherm in July runs over Asia, he may, if the situation is not natural, learn very effectively that the teacher is a fool and that geography is a silly business, and this that he learns is not academic learning, it is not examination knowledge; he very thoroughly knows it. It goes through life with him; he does not forget it. The man in the street does not think much of teachers nor of what they teach, and he learned that at school, in unnatural situations, while being taught the ordinary school subjects. That is what he remembers when he has forgotten all the subjects that were so carefully taught.

We tend to think that learning is all finished at 14 or 15 or 16 or 18 or 22. We try to teach a youngster before he leaves school all the history and geography that he has to know in his life, and then we are surprised when the adult population does not think much of schools or geography or history; but we should not be surprised if we remember, for example, that the number of tons of coal mined, the number of cotton looms at work in Lancashire, the numbers of this, that, and the other are not particularly worth memorising now and are certainly not going to be the same when our pupils grow up. Knowledge of these and other things in themselves is not useful now or then.

In studying the education of primitive peoples, especially Africa, I have felt that a good deal could be said for their methods of education as compared with ours. They do not think that everything is learned at school, as we appear to do. The small boy learns what a small boy ought to know, to live as a small boy *not* as an adult; the adolescent, the young man, the middle-aged man, and the ancient have in turn to learn their duties. It is probable that, in what appears to be a very haphazard way, a boy, by the time he is fourteen, has learned more, and learned it more accurately, than has a boy of the same age in the schools of this educated land. When his life may depend on his knowing and doing this, that, and the other, he gets it 100 per cent. right every time, not 50 per cent. and a pass.

I suggest that the African methods are worth consideration just because a boy learns the things natural to him at his age. He learns actively and is not taught. The situations in which he is placed are such that he is interested in these things now; he has not to wait till he is an adult to see their value and interest.

To use a metaphor, the mental food presented to a boy may constitute a balanced diet; it may contain vitamins and proteins and all the rest in correct proportions, but the essential thing is that it should be suited to the taste and digestion of the youth. A mother does not think of giving rusks to a baby of a month old on the plea that he will require to know how to chew when he is grown up; we can prepare for a baby's maturity more surely by feeding him on mother's milk than on rusks and beefsteak; at that stage the situation is his mother's arms and his mother's breast, and nature does the rest.

My predecessor in the Chair, Lord Meston, said that the object of the Geographical Association was to spread interest in geography among the population. This is ultimately the job of the teachers of geography; if they do not do this they fail in their job. If a boy leaves school feeling that geography is important to him then, and that his teacher is a wise man or woman in teaching the subject, even if he mixes up latitude and longitude and the Rhine and the Rhone, you have done a very great deal. If he had been put into situations so that he had really learned that so effectively that he knew it as part of himself, as the primitive African knows his lessons, would not this be a different country in twenty years' time?

You may not see him put his knowledge into practice any more than does a nurse who leaves an infant of a few months, but if she has put him into situations such that he has learned to crawl he will learn to walk all right when the time comes. If, however, you have crippled his geography, as does a foolish mother who tries to teach her infant to stand too early, by putting him into situations which make him feel that geography is a foolish business and merely a subject for the general school examination, he will never walk properly. The natural situations in which youngsters should find themselves in school are such that they learn to crawl geographically; if they can do that, they will walk later on, never fear, when they have the urge to do so.

While the technique of school teaching, including the teaching of geography, is probably much better in this country than in the United States, yet there is a popular belief in education in the United States, and one cannot say that even with all the advance that has been made in the last sixty years that this is the case in this country. Somehow the teachers of the last generation in the United States have managed to put their pupils into situations such that they know that education is worth having, while here we have taught mainly the opposite. To be called a "professor" in the United States may be taken as a compliment, "professor" here is almost a term of abuse, or worse; even the *Times* recently said a professor was a "stock comic figure." You may remember also that the salary of the President of the Board of Education is less than half that of the Minister of War.

We have said that the situations into which we put out pupils should be natural situations. Do we know what is natural for boys and for girls? I might speak at length on that subject, but I shall merely suggest that boys and girls are no more alike mentally than they are physically, and refer you to the article by Miss E. W. Jones in *Geography*, March 1933, and ask another question, "Do we know what is natural for young folk of different ages?" I think that it is doubtful.

We have all heard of intelligence quotients, or the ratio of mental age to physical age, and know that it remains constant throughout most of school life. Intelligence varies with individuals, but we do not require intelligence tests to inform us that some pupils are more intelligent than others. We know well enough that the geographical wind must be tempered to the lamb with scanty wool, or, if we use the metaphor which compares the desire to learn with physical appetite, we say that food must be suited to poor digestions as well as to age and development; what is natural to a healthy growing mind is not natural to an enfeebled one; a chunk of thick bread and butter, which suits the healthy youth, does not suit him with a poor digestion. A chunk of solid regional geography may be equally disastrous to certain mental digestions. That we recognise, and we also now take some account of the fact that intelligence grows. We do not normally teach Form V geography in precisely the same way as we do Form III, as was done a generation ago or less.

There is, however, a good deal more to it than that. The intelligence quotient, whether high or low, may remain constant, but its quality changes, and there is something besides intelligence to be reckoned with in mental growth. A child is not simply a small edition of an adult; he is physically of a different shape and mentally has different qualities. He not only grows bigger, mentally and physically, but he grows different.

There is general agreement that after infancy the mental life of a young person may be divided into three stages, corresponding to the terms "child," "boy," "youth," and you may, if you like, think of the first ending about 6, 7, or 8, and the second about 12, 13, or 14, though of course neither ends suddenly. Each of those stages differs from the others, both intellectually and emotionally. On the intellectual side they may be characterised by the words "collection," "use," "system." In the first stage, the child is mainly concerned with the collection of things, and especially of experiences; he wishes to see things and touch things; he wishes to "see the wheels go round." In the second stage, the boy is specially concerned with using things, turning them to some practical advantage; and in the third the youth is concerned with systematising things and experiences. In the same way, the three stages of emotional development may be characterised by the terms "wonder," "realism," "idealism." The dominant emotion in the child is wonder; the boy is a realist, the youth is an idealist.

Now note that—

(1) When I say that one of these words, e.g. "wonder," is characteristic of a stage, I do not mean that it is found only at that stage; wonder continues, or

ought to continue, into the following stages. We ought never to lose our capacity for wondering; it is the driving-force of most advance.

(2) These changes happen naturally; we cannot do anything about it except to see that they are not interfered with, to see, for example, that wonder has a chance to develop and a chance to continue into later life. It is something very near akin to murder to kill the capacity for wonder in anyone. But we can no more teach a child to wonder, or systematise, than we can teach him to be an adolescent.

(3) The emotional development is just as important as the intellectual development; psychologists have rather concentrated on the development of intelligence, and the steady development of intelligence at that, and because the business is more difficult, though possibly more important, they have neglected the emotional development, with the result that we ordinary folk have tended to forget how important it is.

If geography teachers really grasped these things, they would revolutionise the teaching of geography at once. In the first place, it is to be noticed that idealising and systematising are characteristic of the third stage, each being an expression of the desire for an unattainable perfection that comes with adolescence, not of the previous stage which is characterised by realism and utility. The normal pre-adolescent small boy or girl has no desires for perfection, attainable or unattainable; he *is* perfect; he is about as self-sufficient a mortal as you can find in this world; he is perfectly sure of himself. Why this little pagan devil should turn into a normal decent adult I do not know, any more than I know why a caterpillar turns into a butterfly, or a flirtatious flapper into a self-sacrificing wife and mother, or a rowdy medical student turns into the trusted family doctor with a quiet bedside manner; but that it does happen is evident to any teacher who has followed a boy's career through the school. In devising situations in which the said pagan devil learns geography, the teacher of geography has to remember that the boy is a realist and utilitarian. Anyhow do not try to teach a caterpillar to fly; you can't do it; wait till it is a butterfly and it will fly all right, if you provide the right situation and have not mauled the caterpillar too badly in your premature attempts at teaching. Feed the human caterpillar on geographical cabbage that he can digest, and reserve the idealistic nectar of international co-operation and the League of Nations till those are his natural food.

But if there is a danger that harm may be done by too early idealising, there is as great a danger that harm may be done by too early systematising. I do not mean to say that pre-adolescent children cannot reason; they can quite easily reason from one thing to another, but a logical sequence is difficult, and, more important still, for a logical *system* there is normally no desire at all. There is no demand for a nice, neat, complete, logical, systematic presentment of a subject on the part of pre-adolescents as there is on the part of adolescents and adults, and especially of university graduates. It seems to me that it is wrong to present the matter to school children that is presented to students at the university; it is obvious that if it is right at the universities it cannot be right under normal conditions at school. But it also seems to me that it is much more wrong to use *methods* in school which may be suited to the situations at universities but are entirely unsuited to school conditions. To teach systems to pre-adolescents on the plea that they will require to use systems later is just giving beef-steak to infants.

How much of our geography that we present to the pre-adolescent is pure system so dear to adults! We divide the world into nicely ordered climatic regions, and physical regions, and vegetation regions, and human regions; and we call them "Mediterranean," and "West continental marginal," or "monsoon," or "A 1" and "C 3," or "maize belts," or "hot dog region of the North-eastern United States," or the "barbecue region to the south." (You don't know what a "hot dog is"? Fancy an old fogey like me knowing more geography than you young people with honours degrees!). We use small-scale maps, too, of the continents for the youngest classes. All of these regions and maps are the most amazing examples of adult systematising, and we present them gaily to immature children to be memorised, quite oblivious of the fact that what they memorise, though it be expressed in pretty and neat designs on maps and diagrams, can mean mighty little of geography.

That is bad enough, but the real mistake is that by so doing we are crippling the development of the power of systematising later, for it is to be noted that what we wish specially to prepare for earlier and develop later in these young people, though some of them may never reach the stage, is the *power* of systematising for themselves, *not* the memorising of other peoples' systems. We *are* teaching the caterpillar to fly, and it is more by good luck, and the natural action of the organism which rejects unsuitable food, than by good guidance that some butterflies survive and do fly.

Now do not misunderstand me. I am all for regional geography and systematic geography and systematic scientific teaching of geography, but as my old chief, Sir John Adams, used to say, "Verbs of teaching take two accusatives, one of the person and the other of the thing." If you try to teach John geography, and, while attempting to teach the geography you omit half the data of your problem and forget John and his characteristics, you are certainly not teaching either systematically or scientifically. We claim that geography is a science, but when I am told that geography in school is not a science I am reluctantly compelled to admit the charge, not because geography is unscientific, but because it is taught unscientifically. The method of science, as of intellectual development, is "collection," "use," "system," but in geography we impose systems on youngsters before they have collected and used their experiences and before they are ready to systematise. That is entirely unscientific.

But that is not all. The other day I heard of a small boy, age just three, who sat entranced watching the sunset on each of two successive evenings last autumn, and then came to his mother and pointed out to her that the sun gets up in the east ("over dere" was his expression) but "goes to its mummy dere," pointing to the west. I think that his mother must have put him into very satisfactory situations in which he learned; for many older folk than he, though they may know that the sun rises in the east and sets in the west, would be unable to say that it was "over dere," and where the east and west were. Then he went on to say "nother sun in morn, lots and lots of suns, dey go to mummy dere." This small boy had collected experiences or data and had come to a natural, if erroneous conclusion, which you, being teachers immediately wish to correct. His mother, not being a teacher, didn't. Using the data, he may come to the conclusion later that it is the same sun each day and that it goes back at night. Whichever it is, it is astounding, wonderful! Then may come the question, "How?"; he may think that it goes back below in a tunnel (I am told that he is great on tunnels); it seems indeed the most natural solution. Other data to be observed later, such as that "over dere" is not always the same place, may suggest that it must be a mighty wide tunnel; possibly it is *all* hollow underneath, a staggering thought! But if he continues with observation and use of observation, one step at a time as he is ready for it, and if he is put into satisfactory situations, he may, by the time he is sixteen or so, have arrived at quite a satisfactory understanding of the relations of the earth and the sun. And if he doesn't, no amount of telling him the usual yarn about the earth going round the sun will ever make him or anyone else really believe it.

You don't, really. Nor do you believe that the earth is round. These are only bits of scandal that you have heard and pass on. You may jeer at the flat earth people, but you really are not much better. You do not believe either of these stories till you *feel* the earth turning round under you and wheeling onward in its yearly course round the sun; and as long as we have nothing to do with feelings and emotions in geography beginning with "wonder," so long shall we not really believe that the earth is round.

Till these facts are recognised and the young people are put into situations more in accordance with them, in fact till it is seen that the teaching of geography is psychological and biological as well as logical, geography will not be taught as well as it might be. It is to be noted that the psychological and biological order and system is rarely the logical order with children and young people, and quite often not with older folk either.

It will be well, therefore, to consider some of these psychological and biological principles as they are applied to teaching. They are enshrined in maxims which summarise the wisdom of the ancients, some of them having special applications to the teaching of geography.

From the Known to the Unknown.

The "known" is what the youngster knows and not what the teacher knows. Also it is what he really knows, not what he ought to know, nor is it even what the teacher thinks that the pupil knows, which puts further limits. Nor is it sufficient that he should be able to say his lesson; in a sense he may know a piece of poetry when he is able to say it, but he does not usually know geography when he is able to repeat the words of the book or teacher. The knowing must have the quality such that he may go from it to the unknown; there must be the same intensity of conviction as the boy has when he knows that the teacher is a fool when he is taught badly. All that is perfectly general and so is generally forgotten.

But it has special applications to the teaching of geography. The importance of this maxim to us lies in the fact that each boy and girl is in a particular physical situation; it strengthens our conviction of the importance of the home region, school journeys and educational visits. These supply the only real measure and illumination of conditions elsewhere, whether these be physical or human, whether it be the height or slope of a hill, or temperature, or rainfall, or the importance of the meeting-place of roads, or geographical momentum, or map study. It is *not* that we should make a special study of the home area, though that is useful, but that the home area should, so to speak, leaven all our teaching; also to study the home area and not relate it to the rest of the world is not going from the known to the unknown. Short-sighted teachers refrain from using the home area because it is never formally examined, but even from this unsatisfactory point of view the teaching of the home area pays. The basing of knowledge on the home area, or more commonly the lack of it, is apparent in every geography script written in an examination; when candidates have never started from the known they have never reached the unknown.

A student, taking a lesson in which the word "factory" occurred, wisely inquired of the boys if any of them knew where a factory was. There was no enthusiasm to supply information on the matter, but at last one boy ventured, in the spirit of an explorer, to suggest that he had heard that there was one in Lancashire. That was all to the good, and the information was accepted in the spirit in which it was offered; but the fact was that across a twenty-foot lane from the school, and clearly visible to each boy in the class, was a factory in full work, and the playground of the school was surrounded by factories whose presence was evident not only to the eye but to the nose and ear. This kind of thing is not unusual, but it is almost criminal.

From Simple to Complex.

Again our criterion of what is simple is supplied by the pupil, not by the teacher. Here also there is very considerable advance over what was done forty years ago: we arrange our syllabuses, at least to some extent, in accordance with it; but let me draw your attention, just as an example and not for the first time, to one case which illustrates the difference between the logical and psychological, or, if you are afraid of the word, the biological system. Logically, in considering space, we proceed as Euclid did in his work, from point to line, from line to area, and from area to solid; psychologically, the order is the reverse of that, as Aristotle pointed out. The baby knows a good deal about solids; his hand will close on an object almost immediately after birth; an infant of a few months knows a good deal about space relations and three dimensions, as do all the higher animals; an object disappears over the back of a chair, and he gets down from the chair and crawls round to where the object is; earlier still, at six months or so, an infant, who has just learned to grasp things, while lying on its back drops the rattle to one side: without looking, it reaches over and picks up the rattle where it dropped. That shows perfect thinking in three dimensions (incidentally, no one taught him). But it is not till very much later that areas are thought of, while lines are later still.

This, of course, has implications on the teaching of geography; it suggests that contour lines, isobars, isotherms and the rest come late and after the young people have become very familiar with areas. These lines, in fact, come into the picture naturally when we think of them as separating two contiguous areas.

This is not only good geometry and good psychology but actual practical common sense. The isobars appearing on this morning's weather chart, and now exhibited round the corner in Aldwych, were drawn not through points but by separating areas which had under and over the pressures indicated by the isobars. The class which attempts to draw isotherms or isobars or contour lines through points will take longer, besides getting muddled in the process, than the class which draws them in order to separate areas. Incidentally, they will have a chance to learn that lines have length without breadth, which is quite good geometry and, unfortunately, is not usually learned in geometry lessons.

This is, if one thinks of it, really an example also of another maxim or principle to *proceed from Concrete to Abstract*, for a line may very well be considered an abstraction. Logical systems are abstract things and should come late; things touched and seen come before abstractions. Then, if we cannot see things themselves, representations of them should come before abstract theories about them.

The use of the word "representations" at once make us think of maps and relief models, but maps and relief models, like many useful things, are dangerous and must be used with care. Maps, as I have pointed out on many occasions, are very often causes of a breach of the commandment which forbids the worshipping of graven images; people think of the map without thinking of the reality for which the map stands. Maps, then, are dangerous, and, as they have to be used, young geographers must be put into situations in which they learn how to use them, to look through them and not at them.

But models are more dangerous even than maps; a map is wrong in two dimensions; a model is wrong in three and usually doubly wrong in the third; it also looks so much more like the reality than a map and is the more dangerous. Used with care a model can, of course, be very useful.

Pictures, however, are without the disadvantages of models; they are useful as fundamental geographical material and not as illustrations. The advantage of using pictures in teaching appears as a by-product of an investigation made by Dr Schonell into the effects of broadcasting in schools. Some of the questions given to the classes, after each of the ten talks, were on what they had learned from the pictures in the pamphlets used in the talks. In the case of nine talks, answers to the questions on the pictures scored more marks than did those on the non-picture questions, and in the case of the tenth there was no sensible difference. Over the whole series of talks the picture answers scored 77·7 per cent. of marks, while the non-picture answers scored 58·3 per cent. There is no doubt about the result.

Nor am I the least surprised. Language is not an extremely satisfactory way of representing fundamental concrete geographical facts. A noun, we are told, is the name of a person, place or thing: it stands for the thing, but it is merely a token; it is neither the thing nor a representation of the thing. Words seem to me to be even more insidious in their evil effects in teaching than maps. They are more soothing; we think that, when our pupils say their lessons correctly they know it; the pupil, when he repeats the words, thinks that he knows the facts; there is something magical about a word, but it is not as magical as all that.

We laugh at Tibetans turning their prayer-wheels, but is our belief in the efficacy of the word any less ludicrous? When a child says that the Mediterranean region has winter rains and summer drought, or that the world is a globe 8000 miles in diameter what is it that he *knows*? Does it in fact mean much more than "Eeny, meeny, miney, mo," or "'Twas brillig and the slythy toves did gyre and gimble in the wabe"? I doubt it.

And when all is said and done, even when they do mean something and are understood, words say so little, so extraordinarily little, as compared with what a picture says. Take the simplest geographical picture that you can find and try to put it into words so that the hearer or reader may know exactly what the picture is like, and you will find that it simply cannot be done; so much is missed out and so much is inadequately expressed. Language is a great invention, but certainly, as I have said, it is an extraordinarily inadequate means of representing geographical facts.

Pictures, even moving pictures, do not, of course, solve all the problems of the teaching of geography, but for descriptions of things they are vastly better than words. That the use of pictures has greatly increased in recent years is all to the good, but we are still not doing much more than fumbling after the best ways of using them in teaching. As for moving pictures, we have only just realised that they may be useful. When methods of using pictures of all sorts are developed, not by a few teachers in single class-rooms but by all teachers of geography, then geography *will* be taught better.

Then there are two maxims which seem to contradict each other, but which when they are examined do no such thing.

From the Indefinite to the Definite.
From the Particular to the General.

Let me try to disentangle them by reference to particular cases. The child learning to speak says "bu" for "bus," and "button" and "bunny," and even "ball"; definite endings will come later. Then I referred a few minutes ago to the small boy who pointed out that the sun rose "over dere," and I interpolated "in the east." That phrase "in the east" is my adult generalisation, arrived at after watching the sun for years; it is not always in the east that he rises, nor indeed often; it is varyingly north-east and south-east, but I generalise and say "east"; the small boy is indefinite and fuzzy and says "over dere," meaning "somewhere over there." The baby first moves his arms spasmodically; then he reaches out in the general direction of things that attract him; then he touches them; then fingers begin to curve inwards; it is not for a long time that he grasps. The mind of a child, adolescent or adult moves in the same way. Fuzziness is the inevitable preliminary to definiteness. But, while reputable geography textbooks no longer begin with the shape and size of the earth and definitions of islands and isthmuses and peninsulas and lakes, we still begin the study of contour lines and isobars and isotherms with definitions, notwithstanding that the de*fini*tion comes, as its name implies, at the *end* to clear things up, and it is the youngster who becomes definite in his ideas and formulates his definition from his own experience. And, if he never gets as far as formulating a definition, it will usually matter mighty little; he gets on quite well without formulating definitions of "dog" and "mother" or even "map" and all the other important things; it is not definitions that matter but connotations, and these are continually being added to by experience.

The maxim *From the Particular to the General* seems to me to gather up most of the ideas in the others, and to be the most important for us, especially as it is a hard saying for teachers of geography. What are most of the things we teach, not that the pupils learn, but generalisations? Those maps of the continents and countries, those Mediterranean and other regions, are systematised generalisations from myriads of particulars. Herbertson worked out his climatic regions on a basis of particular stations where particular observations had been taken for many years. But the boys and girls are given his results. If we cut out our generalisations from our teaching, there would not be much left.

What are we to do? Shall we strike a Lutheran attitude and say, "We are very sorry, but, however unsatisfactory it is, we can do no other"? Or shall we totally deny the validity of the maxim, or shall we try to mend our ways and teach geography better?

We can scarcely deny the validity of the maxim, for it is recognised as true in other subjects of the curriculum. There was a time when boys and girls learned rules and did things in accordance with them, but that time, if it is not past, is passing. They learn languages, their own and others, by using particular words, by speaking particular sentences, writing particular compositions and reading particular books. They learn arithmetic by doing particular sums in addition, subtraction, multiplication and division, percentages, stocks and shares. They learn algebra in the same way; in geometry the generalisation is arrived at by considering a particular figure. In science laboratories work is done with particular experiments, using particular apparatus and materials: half a gramme of this is heated; a gramme of that is dissolved; a particular bean is observed to grow. Generalisation comes later.

We shall find it very difficult to deny that the maxim is valid, and, if we do, we give up for ever the claim that geography in school should rank as a science, for the method of science is based on the collection and use of particulars which are eventually systematised and generalised.

And yet, if we accept the principle, we seem to be landed in a terrific tangle, for, in these later years of the new geography, we have certainly taught generalisations. Perhaps some of you whose teaching has been confined to pupils at the later stages of adolescence, or students at the university, may have been pharisaical enough to feel that the strictures, which I made a few minutes ago on too early systematisation, did not apply to them. But the maxim I am now considering has no age limit; it applies to all teaching.

Of course, there have been some prophets in Israel who, if they have bowed the knee to Baal, have at least pressed the ground as lightly as they could. Those who have used the home area as a yardstick with which to measure the world have done something toward the scientific treatment of geography; a glass of water may introduce a lesson on the rainfall of Britain, a cotton duster one on Lancashire, a particular simple concrete bit of coal from a particular Doncaster colliery may introduce a lesson on the Yorkshire coalfield. Something too has been done by practical work of some kind or another, some kinds being worse than others; for example, drawing climatic and economic diagrams from statistics can be said to be only barely faintly colourably scientific; the science master would not reckon that his boys were doing practical science if, instead of working with concrete materials and obtaining their own results, they plotted statistics which he gave them and which were averages at that.

The claim of pictures to be fundamental geographical material is strengthened yet more by a recognition of the fact that they are obviously particular, and their increasing use helps to make the teaching of geography a little less unscientific.

When all this has been said, however, we are only making the best defence of a hopeless case. We do teach generalisations to everyone. What are you going to do about it? It is your job, not mine.

But, before I retire to my Sabine farm, I have one suggestion to make. In so far as it is new, and it is old in idea, I could not see, when I first thought of it, how it could possibly work, but the more I have thought about it the more it appears not hopelessly and absolutely impossible. Something might be done with it.

If we are to teach in agreement with the maxim, we must start from particular cases and go on to generalisations. The old school geography dealt with isolated particulars which were never generalised; the new, though it has not quite rid itself of that tradition, deals mainly with generalisations without proceeding from particulars. We wish both to start from particulars and to proceed to generalisations. How can we do so?

Let us for a moment consider the teaching of another subject, arithmetic. I said earlier that we might learn something from an arithmetic lesson. In some ways it is the most satisfactory subject in the curriculum to teach. I know that sometimes it is considered difficult, but for the very reason that I consider it easy, i.e. that you know at once whether you have taught what you set out to teach; you cannot so easily as in other subjects deceive yourself that you have taught something when you have not done so. It is satisfactory too, because in arithmetic, as distinct from other subjects, youngsters are normally, not exceptionally, put into situations in which they learn what the teacher wishes them to learn. It is satisfactory not only because the youngsters do all the work, but because you can test whether they can do it or not. The method of learning and testing is done by working examples.

Now note that phrase "working examples." First, the word "work." The children are not given the conclusion to learn; they have to find it. Even when they have found it they are not required to memorise it. It is the working with the material and finding something for themselves that matters.

But more important is the word "examples" or "samples." There is no attempt to work all the possible particular sums that may be worked, but samples are worked. In geography there are multitudes of particulars often taught as isolated unrelated particulars.[1] Now, cannot we do something in geography in the way of working with samples, or, to use a word with which we are more familiar, types? The type is the half-way house between the particular and the generalisation. It is, in fact, particular, but has more than particular significance.

Now I hear you say: "That is nothing new, we know all about types of climate, we always teach types of climate, and you yourself only a minute or two ago were guying these types; now you turn round and say that is what we must teach." But I have already said that the idea is not new; in the second place, I don't say you must teach them; and in the third, these types of climate are not particular types at all, they are, as I have pointed out, generalisations. Further, these climatic types are usually taught by starting with a world and dividing it up, and, whatever the world is, it is not a "particular" from which we may proceed. Proceeding from the world to

[1] Again, one of the further advantages of pictures lies in the fact that in any picture many particulars are seen related but not generalised.

types is not proceeding from the particular to general. Nor is proceeding from a continent any better.

That is obviously not what I have in mind; the approach is from the other end, something much more nearly akin to what Dr Unstead has proposed in his Herbertson Memorial Lecture, and what he has done in his paper to the Royal Geographical Society on the Lötschenthal, what Dr Mill gave an example of, years ago, for an area on the south coast, what Herbertson did do when he set people at the universities to study special small regions. These are, however, for adults, and I am discussing the teaching of adolescents and pre-adolescents. What I mean will be clearer if I refer you to a particular example; it was, in fact, written for adults, but it seems to me to have suggestions for school teaching. It is given in *The Geographical Teacher*, Autumn 1924, and is entitled "Farming in Tuscany" (Donald Gray).

The farm described is obviously a particular place; it is not just any place round the Mediterranean, and certainly not an exceptional place; it is typical of its immediate region on the one hand and of the whole of the Mediterranean on the other. I go so far as to say that, if pupils must learn by words, they will learn more of the Mediterranean region by learning these words than by learning the same or double the number of text-book generalisations about the Mediterranean. Notice also that here we have that detail which is the lifeblood of all teaching because it is particular, but which is usually omitted entirely when we study, as the syllabuses put it, "the rest of the world in decreasing detail," which, in practice, means "increasing generalisation," as we have had only generalisation to start with. With a few pictures, still and moving, on which to base the text this extract would seem to me to suggest at least one very important way in which we might teach geography better. Detail and generalisation would each come where they belong.

By teaching in this way we should be making geography scientific. This is in agreement with the methods of science which begins, as I have said, with the collection of particular material and goes on to use and systematise it. But, further, it is in agreement with its ultimate aims. The Report on Science Teaching in Secondary Schools issued by the British Association speaks of "the persistent attempts to understand nature which we call science," where the emphasis is on "attempts to understand nature" and not on "attempts to give the reasons for" things. We tend in geographical work in school to insist overmuch on causes, and often on causes with a capital C. "How" rather than "Why" is, however, the watchword of modern science, and the geographer might take note of the same; by insisting on reasons and causes unduly we are making geography not more, but less, scientific. The Lancashire cotton industry is not where it is "because of" west winds, coal, and a position facing the Atlantic. These maxims which I have quoted all have to do with the intellectual development of the young people and the scientific aspect of the subject. What maxims relate to the emotional development and the human side? It is extraordinarily significant that there are none. I must supply the lack as best I can.

I have, indeed, already said something of the importance of "wonder" in teaching geography. I have spoken too of the importance of recognising the fact that the boy is a realist. I would equally stress idealism in its right place, the place, in fact, where the youth asks for bread and where in place of bread we give him an emetic called the General School Examination.

Then I commend to you as a teaching maxim a principle which I came across in my mathematical days, and perhaps it may appeal to the educational psychologists who try to reduce everything to mathematical formulæ. It is *Action and reaction are equal and opposite.* Reaction to what a teacher teaches is a natural phenomenon, especially where morals, ideals, and actions are concerned. When I am *told* to do a thing, and especially if I am told that it is the *right* thing to do, I naturally wish to do the opposite; when ideals are held up to me as worthy of imitation a doubt creeps in. Certainly many of our pupils feel like that; the very fact that something is taught in school introduces a handicap; energies which ought to go to learning are used to react to teaching. Much of our teaching, even of geography, is so much less effective than it might be because it is rammed down the throats of our pupils, and to the ramming there is a natural reaction which results in a dislike of the subject taught. When something is radically wrong, then forcible feeding may be necessary, but appetite is not increased by it.

In some respects, too, the teacher of geography has more opportunities of presenting ideals of conduct than have the teachers of other subjects, and he has to be specially careful in case he rouses hostile reaction and has results the opposite of those he intends. In this matter also it is, in fact, because it is so much more effective in desirable results, that putting people into situations in which they learn is so much better than teaching.

But the maxim which I have just quoted emphasises merely the negative side of our work. The emotion, the feeling that we wish to evoke in our pupils, is positive, the feeling that the study of geography is worth while; if we have put them into situations so that they have learned that fact we have done well. If we do not do that, then our labour goes for nothing, and we cannot complain if time given to geography is taken for other subjects, biology or Greek, if these are taught in such a way as to be felt to be worth while. Geography must not only be scientific, it must be scholarly, and more especially it must be a humane study if it is going to be felt to be worth while at school by the pre-adolescent and the adolescent, and if the adult, as Lord Meston suggested, is going to feel later that it was worth while.

Of that I could say much, but I shall say only this, that in the worth-whileness we must not forget the æsthetic side of geography. It would at least be something if we could induce in our pupils an appreciation of the beauty and wonder of the world that an old friend of mine had who died a short time ago. He was no geographer, he worked in an architect's office, but he had with me, and much more often by himself or with other friends, tramped the Scottish hills and countryside and had learned his geography through his boot soles. When he died a friend wrote to me of him, "People would say that his life was a failure, but there are few people who have enjoyed the world as he did; many's the time I have seen him come home fair greetin' with the beauty of it all." "Enjoyed the world!" Did I say he was no geographer? He was; the best kind of geographer.

In this address I have attempted to deal with fundamental teaching principles and apply them to the teaching of geography. I have stated what seems to me the fundamental maxim and discussed its implications. I have pointed out what is natural at different ages, and I have indicated what appear to be some of the important matters that have to be taken into consideration if our teaching of geography is to be scientific and humane. And now let me end as I have often begun. I have in courses of lectures begun by pointing out how valueless is much of the geography which we teach because it does not deal with realities; a study which is founded on error cannot have the validity which we desire. I hope that the suggestions which I have made, even if you believe and act on only half of them, may help you to get rid of at least some of the underlying reasons for the existence of these unrealities.

Finally, a word or two on the manner of the giving of the suggestions. There was a story which was current in my youth in Scotland. One minister had come to assist another at special services, and on the Saturday night they were discussing the subject of the visitor's sermon on the following day. The host asked his friend what his subject was and was told that it was the evils of strong drink. His host expostulated and said that that would never do, as a good proportion of his congregation took more than was good for them.

Some other prevalent social sins were suggested as subjects and rejected with vigour for similar reasons. At last the visitor said: "Well, but what can I preach on?" "Thunder against the Mormons," was the reply. "Thunder against the Mormons; there isn't one within thousands of miles." At least you cannot accuse me of thundering against things that are 1000 miles away.

If I have seemed to violate my own maxim about action and reaction, and have appeared rather to have rammed things down your throats, it has been an attempt to use an address, a difficult medium for a real teacher, to put you in a situation. I might have discussed the past and pointed out what extraordinary advance has been made in the teaching of geography in the last forty years. We could have patted ourselves on the back and said what fine fellows we were, and held ourselves up to the admiration of the younger folk. But at the close of my teaching career I have preferred to point out how many mistakes we have made, to look to the future and suggest what may, and I trust will, be done towards improvement. Geography teachers have a reputation for enthusiasm and good teaching. Is it too Victorian to say "Excelsior?"

APPENDIX

THE GEOGRAPHY ROOM

We have in various chapters assumed that a special room should, if possible, be set apart for the teaching of geography. We shall here consider what are or should be the special features of such a room. As a matter of fact very few rooms have been specially planned for the teaching of geography, and of those which have been planned for this purpose very few have been built after adequate consideration of what a geography room is or wherein it differs from other class-rooms.

In any school two sets of considerations, general and particular, have to be taken into account in planning a geography room. On the one hand we have to consider the purpose of the room and what means may, in general, be employed in order that that purpose should be fulfilled. We have also to consider local conditions which may modify the general arrangements. It is, of course, only the general problem with which we are here concerned.

We have to consider such general questions as "What size must the geography room be?" "What apparatus should be provided?" "What should be the lighting arrangements?" "Should there be desks or benches?" "What should be the arrangement of those desks or benches?" and to suggest how these questions may be answered.

The first point to which we would draw attention is that the room set apart for the teaching of geography requires to be both a class-room and what in natural science subjects would be called a laboratory. Work takes place both outdoors and indoors. The outdoor work cannot affect the geography room, except in so far as it will be necessary to have cupboard and locker space for storing the necessary instruments.

The work indoors, for which special provision should be made, is of five chief kinds.

1. The drawing and constructing of maps, plans, and diagrams from materials supplied.
2. Modelling.
3. Consulting large scale maps, plans, and charts.
4. Observations of the heavenly bodies, especially the sun.
5. Observation of specimens, geological, botanical, and economic. Provision must be made both for these activities and for the storage of materials.

It will depend on whether the school course includes physics and botany, whether or no arrangements should be made for some definite experimental work in the subjects omitted. In a school where botany is not a subject of the curriculum, the geography course must, almost of necessity, include some practical work dealing with the importance of water in plant growth.

There will also be required for class work:

1. Text-books and atlases.
2. Large wall-maps.
3. A blackboard or blackboards.
4. A large blackboard globe.
5. Lantern and screen.
6. Reference books.
7. Sundry appliances, *e.g.* stereoscopes and slides.

These again all require that provision should be made for their storage and use.

But there are still other considerations to be borne in mind if we are to arrange for the fittings of the room, and find out its most suitable size.

1. For individual work, when the pupils are working separately, it is immaterial whether they "face" one way or in different ways, but for class work it is imperative that they should face the same way. As provision cannot be made for both arrangements, it may be taken as necessary that the pupils' working desks or benches should all face the same way.

2. For the exhibition of large wall-maps, the most convenient arrangement is to have a large blank wall, not cut up by windows, which the class should face. On this wall must be

a blackboard. A blackboard globe (p. 201) should also be on view at this side of the class-room. It is usual also to have the "administrative" desk in front of the class. This may be convenient in rooms devoted to the teaching of other subjects, but in geography it is distinctly advantageous to have the administrative desk elsewhere. There is the less obstruction in the view of the wall-maps, blackboard, and globe.

3. The administrative desk may be either to left or right of the class. The teacher can still teach from the front of the class-room, but when the class is engaged at work and the teacher is not among the pupils, he can more easily "look down the rows" from the side than from the front, and direct the work that is to be done.

4. The lantern screen must be in a position to be seen by the class; the lantern must obviously be in such a position that it can be directed at right angles to the screen. We have in Chapter XVI pointed out that there must be some kind of triangular arrangement of screen, lantern, and class. If the administrative desk is at the side of the class, the lantern may be placed on it, and the screen may be arranged in the opposite corner of the room to right or left of the class, according as the administrative desk is to left or right. As one naturally works with one's right hand, the lantern will most conveniently be placed at the right-hand end of the desk. This implies that the administrative desk should be to the left of the children and the screen to the right front, as in fig. 48, *a*, rather than in fig. 48, *b*.

5. For observations of the sun there should be a clear view from one window to S.E., S., and S.W., with a carefully levelled flat space on which shadows, cast at various times of the day, may be accurately measured, and on which sun-dials, etc. may stand. This space may be outside the window, but it will be much more accessible if it is inside. The reason for having the window open to S.E., S., and S.W. lies, of course, in the fact that during school hours the sun is to be seen in these directions. It saves a great deal of time if the observations of the sun can be made in the class-room rather than in the play-ground, while the psychological effect of having the sun in view during actual class work is of very considerable importance. The desirability of having a window open as we have suggested

implies that the geography room should be placed on the south of the school buildings, and as high as possible. Few schools are oriented exactly N.S.E.W. so that there is one corner where the window may be put. This implies that the windows will be on the S.E. and the S.W. sides. The long side and the side with the administrative desk will therefore face N.E. and N.W. As we have already pointed out, the administrative desk is to the left of the children as they sit facing the long side, so we

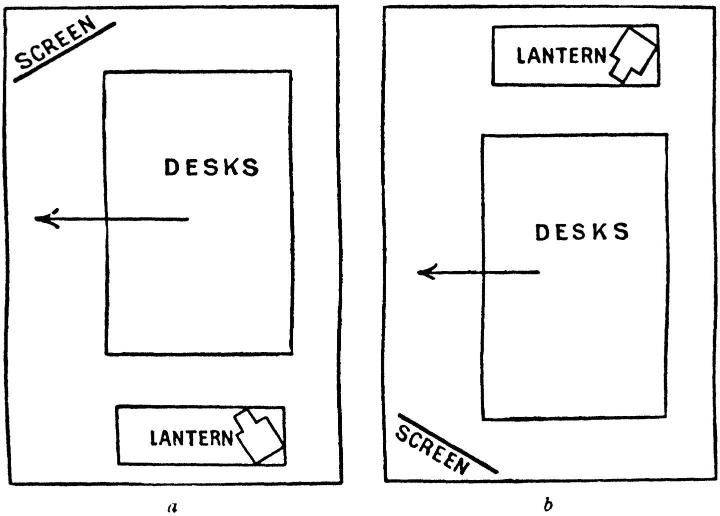

FIG. 48.—Alternative methods of arranging the lantern in a Geography Room.

come to the conclusion that the long side is that facing N.E. The other long side with windows will face S.W. It will be well also that there should be windows on the short side facing S.E.

6. It will be necessary to have a considerable amount of cupboard space for storing maps, pictures, apparatus, specimens, and surveying instruments. The map cupboard need not take up very much room if the plan given on p. 207 is adopted. It is well to have the cupboard in the room and not in a passage outside. Large maps must be stored in shallow drawers. If the drawers are too deep it is difficult to get the particular map desired. One bookcase at least will be required

for reference books. Wall space will be required for pictures large and small.

7. A sink and a slate slab will be useful for numbers of purposes. If a dark room is built adjoining the special geography room there will be less need for a sink in the latter.

8. For the construction of maps, for modelling and for work with fairly large maps, it is necessary that each pupil should have desk space of about 30 inches by 24 inches. This takes most of the ordinary map sheets. The same considerations make it desirable that the pupils should work at tables or benches rather than at sloping desks.

9. For special work with large maps a larger table space than 30 inches by 24 inches is necessary. This may be obtained if the map drawers and most of the cupboards are at a height of a laboratory bench and have a table surface. It would be an advantage if a tracing table is also fitted above one of the sets of drawers or cupboards. In its absence tracing can be done by placing an electric light under the glass of an exhibition case.

10. The size of the room will be determined partly by the number of pupils whom it is intended to accommodate at a time, and partly by the amount of space necessary for the various fittings. The shape of the room will be determined largely by the way in which the fixed number of pupils is best arranged for class and practical work. It is evident that with all the claims made for space for working benches or desks and for storage and exhibition purposes, this room must be of considerable size; it must have not only considerable floor area but height. At the same time no space should be wasted, and for class work the class should be as compact as possible. It is here scarcely possible to solve the problem completely, but for the sake of an example of the way in which the problem is to be attacked, we may assume a case in which the class numbers 30. To arrange these symmetrically there may be 3 rows with 10 pupils in each row, 5 rows of 6 pupils, 6 rows of 5, or 10 rows of 3. If we assume that the pupils will sometimes work in pairs we cannot have an odd number of pupils in each row, and the two latter arrangements are eliminated. The choice lies between 3 rows of 10 and 5 rows of 6.

The bench accommodation affects the decision as to which of

FIG. 49.—North corner of the Geography Room, William Ellis School, Allcroft Rd

[To face page 394.

FIG. 50.—West corner of the Geography Room, William Ellis School, Allcroft Rd.

To face page 395.]

these is the better. If there are single long benches to accommodate 10 pupils at each, the length of each will be ten times 30 inches or 25 feet. If a space of 3 feet is allowed between the benches for seats and passage way, we find that the space required to accommodate the class is 25 feet by 15 feet. If a 2-foot gangway separates each pair of pupils, the space required is 33 feet by 15 feet. Other arrangements are possible; for example, there may be only one 2-foot gangway, in which case the space required would be 27 feet by 15 feet.

The front bench cannot be nearer to the blank wall than 7 feet. The master's platform with the "administrative desk" will be about 5 feet 3 inches or 5 feet 6 inches wide; the class cannot be nearer to this than 4 feet. The table for sun experiments requires to be of a considerable size, and there must be space for a class to stand round and observe. There should also be provision for working benches for large maps, etc. along the two sides with windows. The portion of the room in which the class sits cannot therefore be nearer those walls than 6 or 7 feet. This implies that if the pupils sit in 3 rows of 10, the smallest room which fulfils the required conditions is at least 43 feet by 27 feet. A room of this size is large enough to accommodate all that it is desirable to have in the room. The blackboard globe (p. 392) can be suspended at the left front of the class. It is then in a convenient position to have a bright light cast on it from the lantern, so that day and night may be explained as easily as they may be when only models are possible. The bookcase and the taller cupboards may be on the same side of the room as the administrative desk, and if there is a dark room the entrance to it will probably be on this side also. It is convenient also if the entrance to the room is on that side or at the end of the longer side nearer it.

The windows will be fitted with dark blinds, and again it will be convenient if there is a provision for fastening them *quickly* when they are pulled down. With a boy to each window the room can then be darkened in a few seconds. If the room is lit by electric light it is as well also to have at least one switch by the master's desk, so that the room may be lit quickly if necessary. The switch for the lantern will, of course, be close to the desk also.

Supports for wall-maps (p. 199) will, of course, be arranged on the long wall, and provision may also be made for frames to hold special maps for exhibition. Smaller pictures may be fitted from time to time in the manner suggested on p. 208 on vacant spaces on the walls, while typical larger framed pictures may be hung on the walls above.

The geography room of the William Ellis School (fig. 51)

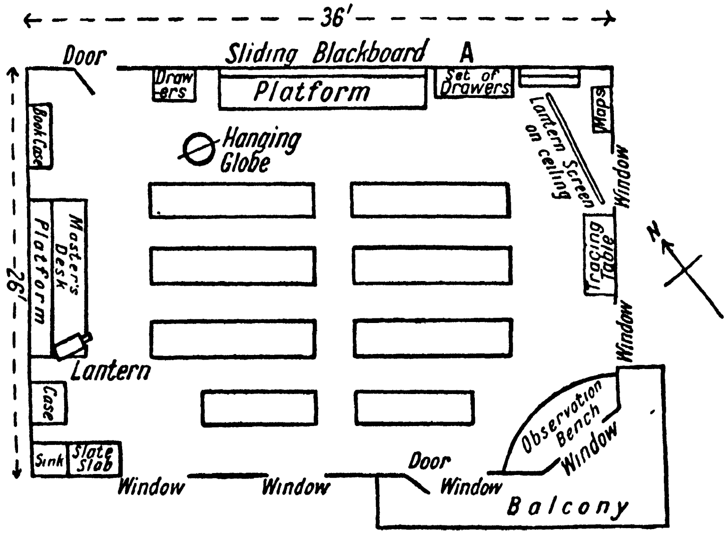

FIG. 51.—Plan of the Geography Room of the William Ellis School, Allcroft Rd.

has been built in accordance with the principles here laid down, except that owing to structural considerations it is a foot or two narrower than is here suggested, and the working benches for large maps have had to be omitted on the S.W. wall.

Two photographs of the room (figs. 49 and 50) are here inserted to show the N. corner and the W. corner. In the former may be seen the hanging globe: in the latter may be seen the administrative desk with the lantern. Round the walls above the pictures is a dado of the names of the great explorers. This adds the human touch, without which even the very material facts of the geography room would be incomplete.

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ABBREVIATIONS

G. Geography.
G.T. Geographical Teacher.
G.J. Geographical Journal.
S.G.M. Scottish Geographical Magazine.

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