AN OUTLINE OF GEOGRAPHY

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Including

A STUDY GUIDE

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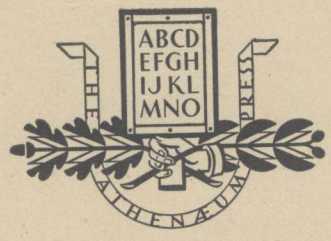

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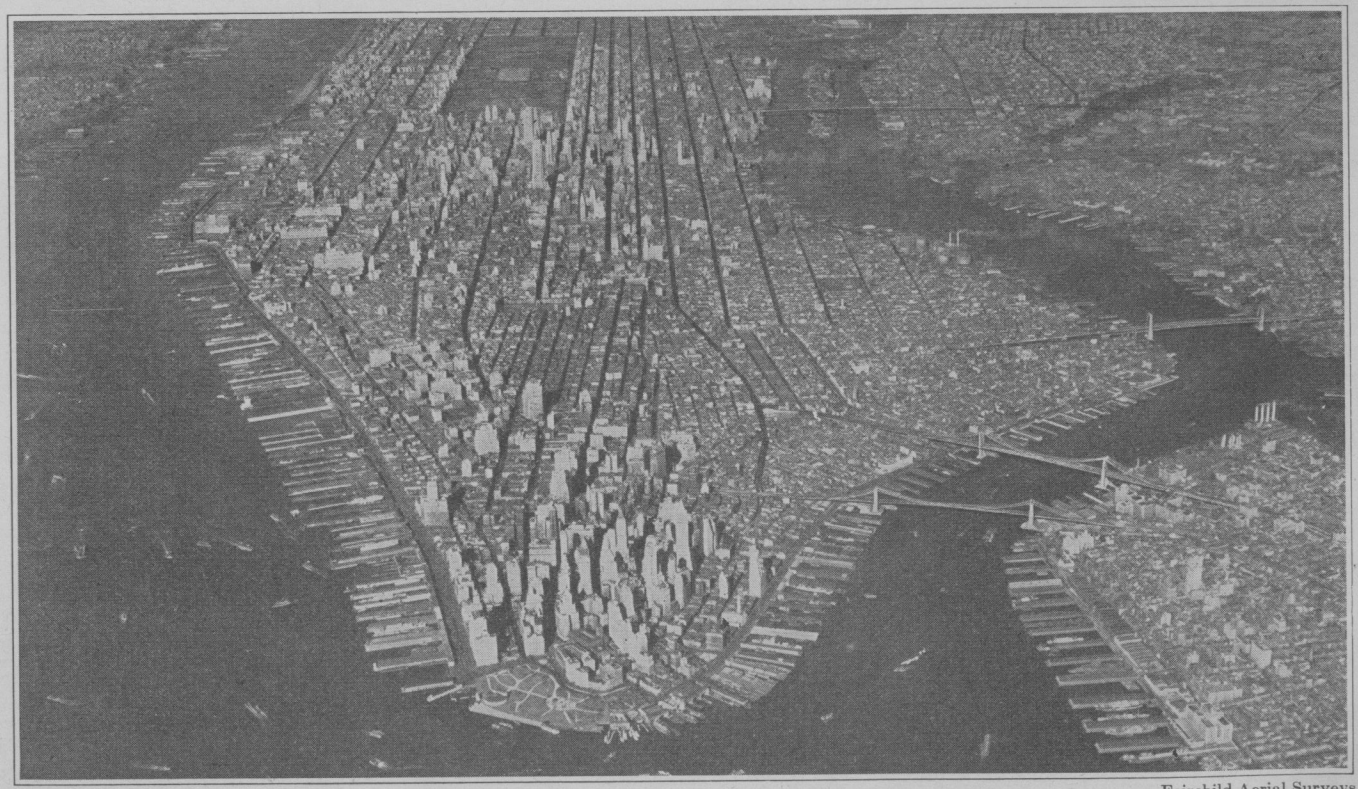

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Manhattan — a major center in the fabric of Occidental settlement

TO · MY · FATHER

Who Possessed the Strength to
See Life as an Episode in a
Corner of the Universe
and yet to Face it with
Creative Vitality and
without Cynicism
or Despair

Preface

THE face of the earth, especially in its role as the home of man, was made the subject of description and interpretation probably even before the beginning of written history. Homer, that somewhat legendary bard of ancient Greece, was among the first writers about the earth; and from him, through classical antiquity, there descends a long line of contributors to the growing literature of geography. Even in ancient times the description of the phenomena on the face of the earth was developed both as an art and as a science. On the artistic side the word pictures of mountains, deserts, seacoasts, cities, or the manifold occupations of mankind achieved a vigor and clarity of expression difficult to surpass. On the scientific side the systematic collection and classification of data, the interpretation of cause-and-effect relationships, and even quantitative measurements were all carried to a rather remarkable degree of perfection. Anyone who doubts the scientific nature of ancient geography should read the works of Strabo and Ptolemy.

Geography as a science, however, has always suffered from one important handicap. This handicap is in the background of Strabo's eloquent arguments concerning the importance of geographical writings to statesmen and warriors — arguments which have been repeated throughout the course of history down to the present. In the modern world this handicap reveals itself, for instance, in the deplorable attitude of certain schoolmen who believe that the subject can be adequately presented by teachers who lack specific geographic training. Geography is handicapped by the fact that most people are so familiar with the details of their immediate surroundings that it seems as if any attempt to describe, classify, and interpret these familiar phenomena could lead only to an elaboration of the obvious; and, sadly enough, in the hands of the untrained teacher much that passes for geography becomes little more than this. In most sciences the obvious things are the broad, general relationships, and the penetration of

greater detail brings forth facts and principles of a more subtle character. In geography the phenomena to be described and understood are much larger than the observer, — it is, actually, the details which are obvious; but the broader patterns and relationships can only be studied or described by reducing them to observable size on maps. To a very small creature living, let us say, on the surface of a half-tone photograph, the details of the printed dots would become quite familiar, and any attempt to study or classify these dots would seem to be a needless application of scientific technique to a very obvious matter; yet the larger patterns of those dots, which are combined in the general areas of light and shade to form the lineaments of a picture, would not really be at all obvious. It is this apparent familiarity with the details of geography which constitutes today, as it has in the past, a major handicap to the development of the subject.

The things which exist together on the surface of the earth can be studied from a number of different points of view. Each set of phenomena can be studied systematically: for example, the landforms, the plants, the animals, or the social organization of the human communities all can be made the subject of description, classification, and interpretation. Geography has been called "the mother of the sciences," since many of these systematic groupings, once handled by geographers only, have become fields of specialization in their own right — for example, physiography, botany, zoology, and some of the social sciences.

But the various objects which exist together on the face of the earth can be studied in another way: in their unsystematic but natural groupings. In other words, landforms, plants, animals, or human communities, instead of being made the subject of special studies, can be investigated with regard to their mutual arrangement on the earth. The face of the earth itself is made up of a mosaic of spaces, each space being composed of a complex of elements grouped together in intricate and intimate relationship. In detail these spaces are what we call "landscapes"; in a broader way they are "regions" in which more general combinations of phenomena may be observed. The face of the earth can be made the subject of description, classification, and interpretation. This we maintain to be the general field of geography.

Certain writers have attempted to define geography in a somewhat different way. Some would describe the field as "a study of the influence of environment on man." Others, less extreme, would define it as "a study of the response of man to his environment," or "a study of the adjustment of man to his environment." These definitions of the geographic objective are held to be inadequate, especially in so far as they have led many less critical writers to seek only those interpretations of man's activities which could be considered as responses or adjustments to environment. A truly scientific discipline could not admit of a definition of its field which would permit only a one-sided approach to a problem or which would limit the subject to the study of any one principle. To define biology as the study of evolution would be analogous to defining geography as a study of the adjustment of man to his environment. Not that adjustments are to be denied, any more than one would deny the principle of evolution; but the scientific student must approach his problem without prejudice as to what he is to find. In any given instance the facts must first be described, then classified, and finally interpreted without limitation as to the kind of interpretation which shall be discovered. Geography as the study of responses or adjustments is in the stage of medieval alchemy; geography as the study of the mutual space relationships of phenomena on the face of the earth is a science.

The professional reader will readily discover the debt which the author owes to certain of the great figures in the geographic world. From the stimulating chorologic works of Siegfried Passarge and Alfred Hettner have come the germs of many of the ideas elaborated in these pages. Passarge's *Die Landschaftsgürtel der Erde* gave a definite direction to the classification of the world into "landscape groups." To the master of French geographers, Paul Vidal de la Blache, and his disciples Jean Brunhes and Camille Vallaux, the author owes the crystallization of many principles regarding the relation of man to the earth. More especially in America, the author is very greatly indebted to Carl O. Sauer and Isaiah Bowman for their important contributions to the clarification of geographic thought and technique.

The direct preparation of this book has required the assistance of many friends and colleagues. During the six years of preparation, which included the publication of two mimeographed editions, the author has been dependent for editorial supervision on the patient, careful, and sympathetic assistance of Dorothy U. James. For the criticism and discussion of various phases of the undertaking during this period the author is indebted to his colleagues at the University of Michigan. For the critical reading of parts of the text the assistance of Carl O. Sauer is acknowledged with gratitude. John B. Leighly aided in the preparation of Appendix A, and I. D. Scott in the preparation of Appendix B. In the considerable amount of labor which went into the compilation of the many maps and plates the author was assisted by Henry M. Kendall, Robert M. Glendinning, and Otto E. Guthe; and for the painstaking care with which they completed their tasks he offers his most sincere appreciation. A number of the maps, which will be readily identified by the reader, were drawn and in part compiled by Erwin J. Raisz, whose "physiographic method" of representing scenery has already received recognition.[1]

The course of study for which this book is a text at the University of Michigan is a so-called cultural course. It is in no way suggested that such a course is a short cut for preprofessional students or a substitute for a thorough training in the basic systematic studies — physiography, meteorology, anthropology, and history. Where this book is used for a year course, as at Michigan, the text should be supplemented with outside reading, and a mimeographed volume of selected regional studies is available for this purpose (published by George Wahr, Ann Arbor). Where the course has no prerequisites, the briefly stated meteorologic and physiographic principles in the appendixes can be used as outlines for classroom presentation. The book is designed also to serve more advanced students who desire to review the whole field, and perhaps reorganize their approach to it. The references which appear as footnotes throughout the text, and especially the selected list in Appendix E, make up a bibliography from which advanced students can build up their knowledge of the content

[1] Erwin J. Raisz, "The Physiographic Method of Representing Scenery on Maps," *Geographic Review*, Vol. 21 (1931), pp. 297–304.

of geography. The proper use of the text does not include the classroom recitation of memorized facts. Instead, the principles and generalizations should be made the subject of discussion and further investigation. Emphasis should be placed on the constant reference to the maps; on the figures and plates will be found the evidence by which to test the generalizations.

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Foreword

WHEN the pre-Aristotelian Greeks had accumulated enough evidence to jump to the astonishing conclusion that the earth was a sphere, the scientific thinkers of their little corner of the Mediterranean world became interested in the practical consequences of that fact. The concept of sphericity demanded great mental effort, and we may imagine the Greeks puzzling over it in much the same way as the little-informed among us wrack our brains about the fourth dimension. There was abundant evidence that the earth was a sphere, but it was rather indirect evidence, and the idea was a hard one to grasp. Just as, nowadays, the fourth dimension sets astronomers and physicists seeking its practical consequences, so, in ancient Greece, the geographers of the time looked for the results on the surface of the earth of the fact of sphericity. As the world was considered to be "sloping up" toward the south, the burning heat of those regions thus nearer the sun would be greater, and that accounted well enough for the dryness of the Libyan wastes. Similarly, the slope "down" toward the north made the "regions of the Bear" farther from the source of heat, and consequently cold and inhospitable, a fact borne out by the bleakness of the lands beyond the shores of the Euxine.

The mathematical Greeks were led to the measurement of the slope, and the work of various mathematicians and astronomers was directed in part to that end. This made it possible ultimately for Eratosthenes, in the third century B.C., to calculate the circumference of the earth. Hipparchus, in the second century B.C., adopted a system of parallels which measured on the surface of the earth the differences in the length of the longest day. These were called klimata. We, following in part the practices of the later Greek and Roman geographers, have changed the concept of "klimata" to one of "climates." For a long time — indeed, throughout the later Greco-Roman period — a rough zonal system of climates (corresponding to the familiar torrid, temperate, and frigid) attributed to Aristotle served as a ready means of

blocking out the regions of major difference on the surface of the earth. As a matter of fact, a theory of climatic areas had probably been developed prior to the discovery of the sphericity of the earth, for we have suggestions from Hesiod (eighth century B.C.) of a concept of Boreal and Hyperborean, and the sphericity of the earth needed only an extension of that idea for the development of a notion of climatic zones. The system of latitude and longitude, derived from the "klimata," was perfected by Ptolemy, who calculated the location of a large number of places to fit them in the scheme.

Greek science was adopted by the Arabians of Mesopotamia and by Europeans. The former, with their superior knowledge of Africa, were led in the person of Ibn Haukal, in the tenth century, to declare that the Greek climatic theory was not serviceable. It did not fit the facts as they knew them. Europeans, on the other hand, kept the Aristotelian climatic scheme, and have used it to the present day in their geographical teaching and their thought in spite of its incongruity with numerous facts known about the surface of the earth as a result of the Great Discoveries.

It is only in most recent times that geographers have gone back to the ancient tradition in their subject. Climatological geographers are attempting a "practical" climatic scheme, — one that will fit the facts, — and other geographers are following them. We are now beginning to see that there is a logical and more or less symmetrical arrangement of the climates on the surfaces of the earth, but that that order and symmetry are not susceptible of such rigid latitudinal measurement as the Greeks postulated.

Few books have been written under the new scheme; indeed, very little work has been done at all. This present beginning of a rational ordering of the data of geography deserves, I think, the careful consideration of those who are looking for a way through the maze of geographic facts. It is more than a textbook: it is a beginning, in English at least, of a well-ordered and systematic geography. It is not the last attempt, nor is it the first, but it is a step along the road which has been the traditional one of the science.

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AN OUTLINE OF GEOGRAPHY

C'est la présence de l'homme dans la nature qui est le plus grand obstacle à la généralisation du déterminisme scientifique; ou, si l'on veut, le mystère des mystères pour l'homme, c'est l'homme lui-même. — CAMILLE VALLAUX

INTRODUCTION · The Face of the Earth

THE only living organisms we know are attached to the surface of that otherwise very ordinary planet, the earth. Among its companions in the solar system the earth is neither unusually large, nor unusually small, nor very far from the sun, nor very close to it, nor possessed of any other astronomical features to lend it distinction. Yet the face of the earth is unique in the known universe. Of all the wide range of possible temperatures that exist in nature, from the tremendous heat of the hottest star to the appalling cold of the outer reaches of space, here at the earth's surface are found air temperatures at which water will neither freeze nor boil. The surface of our planet receives its heat from the sun, and, in turn, the thin gaseous envelope we call the atmosphere is heated in its lower portion from the warmed earth. In this environment, in which water can remain a liquid, life has somehow gained a foothold and through great periods of time has evolved those forms now familiar to us. In the narrow zone of contact between the atmosphere and the solid earth the many and varied forms of life have established the most intimate connections, not only with the soil, the water, and the air but also with one another. In this zone the patterns of the organic and the inorganic are tightly interwoven, and from this dynamic combination emerges the ever-changing mosaic of forms and colors which is the face of the earth.

And "to man the mystery of mysteries is man." He, of all the forms of life, possesses that remarkable ability to raise his head and look about him, to observe his surroundings and himself, to simplify the confused complexity of the things he sees by arranging and classifying them, to imagine explanations, and to make use of his knowledge, little as it may be, in altering and transforming at least the more plastic parts of his habitat. In fact, as Julian Huxley writes, man has done more in five thousand

years to alter the biologic aspect of the planet than has nature in five million years. But much as man has done, most of the basic conditions of life remain beyond his control. He is still a product of the earth and dependent on it — earth-bound.

One of the fields of knowledge into which man divides his observations and experiences is the face of the earth itself. This is the field of geography. To gain a knowledge and understanding of the present-day arrangement of the things organic and inorganic which exist together at the earth's surface is the general objective of geographic study. Of special interest to man are the phases of geography which deal with the forms introduced by man himself in the course of his spread over the earth. From this point of view the alterations of the landscape by mankind are of particular significance. Yet moving about among man-made scenes, as we do, especially those of us who live in cities, we are apt to miss the true proportion of these things as features composing the earth's face. Important as are the forms of human settlement, we must not lose sight of their position as engravings on the older and relatively more enduring background of the physical earth.

Major Lineaments of the Face of the Earth

Among the major lineaments of this background of the physical earth are the continents and ocean basins. The continents are composed of relatively upstanding masses of the earth's crust, between relatively down-sinking portions which make up the ocean basins. The difference in elevation above the center of the earth of these contrasted parts of its surface averages only about three miles, or less than $\frac{1}{1300}$ of the radius. The maximum difference in elevation, or relief, is about 12 miles (between Mt. Everest, about 29,000 feet above sea level, and the ocean deep off the Philippine Islands, about 35,000 feet below sea level). But even this is only about $\frac{1}{330}$ of the earth's radius. Small as are these differences of elevation compared with the size of the planet, they nevertheless measure the major relief features of its surface.

Only about 28 per cent of this surface, however, stands above the sea. Water fills the ocean basins and, overflowing these,

inundates also the margins of the continental masses. As a result the continents are for the most part isolated, while the oceans are relatively continuous. There is more than twice as much land north of the equator as south of it. Except for Antarctica all the continents are broadest in the north, even those in the Southern Hemisphere. There is an almost complete ring of land around the basin of the Arctic Ocean, while, in contrast, the tapering of the continents toward the south leaves an almost uninterrupted sea in the higher middle latitudes of the Southern Hemisphere.

All these various continental masses are tied together by more or less continuous chains of high mountains. These mountain ranges, passing from continent to continent or festooned around the oceans in strings of islands, form a framework to which are joined the other major lineaments of the earth's face. Without regard to the complexity of detail at this time, the general distribution pattern of high mountains is one of relative simplicity but profound significance. In a sense the central and southeastern part of Asia is the core of the world's lands, and in the present-day world it is composed of a complex knot of towering mountain ranges. From this core mountain axes extend in three directions: one westward through southern Asia, southern Europe, and northern Africa to the edge of the Atlantic Ocean basin; and one northward and one southward to form, through the American continents and the Pacific margins of the Antarctic Continent, a broken ring of mountains around the basin of the Pacific Ocean. The manner in which the several continental masses are joined to this framework gives to each its own peculiar shape. Yet these various lands, when plotted on a polar projection, appear as three peninsulas radiating from the Asiatic core (Fig. 1): Europe and Africa, depending from the western limb of the mountain system; the East Indies, Australia, and New Zealand, depending from the southern limb; and the American continents, attached to the limb which starts northward through eastern Asia and crosses into the Western Hemisphere through Alaska. The land masses of the world, therefore, are not symmetrically arranged with reference to the poles and the divisions of latitude and longitude.