It ought not to be necessary to remind workers and institutions of science that they belong to a highly favored group: they are allowed to work at what pleases them; they are not subject to the time clock; their incomes enable them to live in comfort; and they have no overhead of rent, light, heat, electricity, supplies and clerical or technical assistance to earn before paying salaries. Yet when the suggestion is made that they pay for the means of dissemination of the work done under their auspices the air is rent with cries of anguish.

The benefits might be several if institutions and workers paid for publication of their effusions: subscription costs could be cut and the individual worker could subscribe to more journals and thus increase his usefulness; fewer papers would be written; the papers would be better written and prepared; papers would be shorter when brevity was adequate for exposition and longer when space was needed for clarity; and the literature could carry all necessary tabulations of raw data, while many unnecessary tables, charts and diagrams would be omitted.

To the idea there can be no objection raised which will withstand the cold light of logic—and scientists should be logical.

What more needs be written save that this is no new procedure but one which was generally employed before publication of scientific work became commercialized.

If scientific societies, journal organizations, and the like have the courage to act according to these basic principles, all the difficulties which to-day beset the publication of scientific work and over which there is so much avid discussion will be dissolved, and science will be the better for it.

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FELLOWSHIPS IN HUMAN BIOLOGY

THROUGH the generosity of an anonymous donor there are available a limited number of fellowships for the current academic year in the department of biology of the School of Hygiene and Public Health of The Johns Hopkins University. They are intended for persons interested in problems of human biology. One, carrying a stipend of $1,200, is open only to a worker who has already taken the doctorate. Others with smaller stipends are open to graduate students who have not yet taken the degree.

Applications setting forth the candidate's training, experience and research interests, as well as any letters in support of the application, should be sent promptly to the undersigned at the address above.

RAYMOND PEARL
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SCIENTIFIC BOOKS

CURRENT TRENDS IN GEOGRAPHY

Elements of Geography. By VERNOR C. FINCH and GLENN T. TREWARTHA. McGraw-Hill Book Company, N. Y. 782 pp. 399 illus. 9 plates. 1936. $4.00.

An Outline of Geography. By PRESTON E. JAMES. Ginn and Company, Boston. 475 pp. 182 illus. 24 plates. 1935. $3.00.

Geography, an Introduction to Human Ecology. By C. LANGDON WHITE and GEORGE T. RENNER. D. Appleton-Century Company, N. Y. 790 pp. 333 illus. 1936. $4.00.

Fundamentals of Economic Geography. By NELS A. BENGTSON and WILLEM VAN ROYEN. Prentice Hall, Inc., N. Y. 802 pp. 300 illus. 1935. $4.25.

THE appearance within a year of four excellent college texts in geography, each distinct in treatment and among the best of their type which have yet been written, reflects the vitality of this old and yet very new field. Geography's recognition as an essential college subject has largely developed since the war. To-day almost every prominent central and western university includes a department, although its introduction along the Atlantic seaboard has been less rapid. In European universities it is even more widespread than in this country. The increasingly scholarly character of the subject, as illustrated in these stimulating volumes, should hasten its spread.

In order to appreciate the divergent approach to the first course in college geography, it may be helpful to summarize the historical preface of Finch and Trewartha. In ancient Greece, where geography had its beginnings, it embraced two distinct fields; the description of places and the understanding of a miscellaneous variety of natural phenomena, such as weather, earthquakes, rivers and tides. Until the middle of the nineteenth century this dual interest continued to define the field. Within recent years, four distinct developments have occurred. In the first place, geography has been relieved of the various divisions of natural science which have assumed their independent place as geology, meteorology, etc. With this narrowing of its physical field, the study of land forms received added attention. The four-fold field of physiography, embracing geomorphology or the study of land forms proper, meteorology, oceanogra-

phy and mathematical astronomy, continues to occupy a significant place in geographic interest, but its genetic aspects belong to other sciences.

The third development of recent years is a new emphasis upon the relationships between man and his environment. This field of human geography or ecology has so blossomed in this country that it has often been considered the chief characteristic of American geography. This is a new note in geography, for while students of the earth have always been concerned with interactions there has not until recently been any attempt to proclaim the consideration of man's relations with nature as purely geographic, or to make this the core of the subject. Quite recently, the oldest of all geographic interests, that in areal description, has been vigorously revived by European scholars and a number of younger American geographers. This is regional geography or chorography, the study of places and areas, and is an attempt to define a distinctly geographic field of inquiry. This newest and yet oldest phase of geography stresses the landscape, which embraces not merely what one sees photographically but all those elements, whether natural or man-made, which give character and unity to an area. In terms of a formula, the geographic landscape is composed of the fundament, or the natural environment as it exists apart from modification by man; plus the occupance, or the material impress of man's culture; as modified by succession, or the time factor. In the judgment of the reviewer, this latest development with its emphasis upon field work appears most likely to yield scholarly results and to win the approval of related disciplines.

Three of the books under review consider these different lines of approach. James is a strictly regional treatment of landscape groups, White and Renner is concerned with relationships, while Finch and Trewartha present the component elements, physical and cultural, which make up the areal scene. Bengtson and Van Royen, on the other hand, is a combination of all three which stresses the economic aspects.

"Elements of Geography," by Professors V. C. Finch and Glenn T. Trewartha, of Wisconsin, is essentially a preface to geography proper in that it deals with the various "elements" in the landscape, natural and cultural. A brief closing section is devoted to the five major geographic realms, and other chapters are similarly areal, but the bulk of the volume considers the principles which one must understand before undertaking regional studies. Three quarters of the book deals with the natural elements of the landscape, in which processes are distinguished from the resulting earth features. Climate receives the major emphasis, and is followed by land forms, natural vegetation, soils and mineral resources. One might wish for proportionately fuller consideration of vegetation and soils, but the material is clearly presented and up-to-date. The authors recognize that the second major section of the book is the weakest, that on the cultural elements of the landscape. Geographers are interested in many phases of human activities, but especially as they impress themselves upon the visible earth. Aside from anthropology and agricultural economics, the social studies have generally failed to give the same consideration to the analysis of landscape patterns and their distribution as have the natural sciences. But since the geographic landscape characteristically includes items of settlement, circulation and utilization, it is regrettable that this section of the book is but one tenth as long as the first. As a survey of geographic principles the book is admirable, but in view of the very brief attention given to geographic realms it would appear unfortunate if this should be the student's only contact with geography as a whole.

"An Outline of Geography," by Professor Preston E. James, of the University of Michigan, is based upon the conviction that college geography should aim to clothe the map with meaning; the book therefore plunges directly into the consideration of regional groups without prior attention to principles. This is a new and questionable procedure. The opening chapter considers the dry lands in terms of their natural fundament and human occupance. Scattered through the book are brief sections on climate, soils, topography and settlement, and three lengthy appendices catalogue details of the atmosphere, lithosphere and hydrosphere. Since the book is organized in terms of vegetation units, such as the tropical forest lands, grasslands and boreal forest lands, more consideration should have been given to the principles of plant ecology. Sections on cartography and occupance forms are also needed. The book is overly brief, and the Koeppen symbols are too difficult for underclassmen. Unfortunately, neither this nor the other volumes have any world map of regions on a strictly geographic basis. Despite several details of organization, the geographic philosophy of the book is stimulating and sound. Professor James's volume marks a significant advance in American geography, for the subject here ceases to be merely a collection of interesting data and becomes an organized analysis of landscapes. This emphasis upon *place* is the core of geography.

"Geography, an Introduction to Human Ecology" is by Professor C. Langdon White, of Western Reserve University, and Dr. George T. Renner, of the National Resources Committee. The authors consider that: "wherever mankind has established relationships to the natural environment, those relationships are geography or *human* ecology" . . . "this relationship

concept is the only justification for geography's existence." These adjustments are economic, social and political, and are discussed in connection with the seven "factors" of the natural environment—climatic, biotic, physiographic, edaphic (soils), mineral, hydrographic and spatial. A closing section is devoted to the region as a geographic unit. Throughout the book there is a wealth of data drawn from diverse environments, in all of which man stands out as the central object. White and Renner have written a painstaking and attractive analysis of geographic influences, and their volume is a worthy and temperate successor to Ratzel and Semple. This is the best volume of its type and deserves a wide reading outside of geographic circles. The only question concerns the desirability of the ecological approach, with which some will not agree.

"Fundamentals of Economic Geography," by Professors Nels A. Bengtson and Willem Van Royen, of the University of Nebraska, is designed for students of business, but will undoubtedly find considerable use in liberal arts courses. It follows familiar lines, but with much new material and better balance than other books of its type. It has already been favorably reviewed in SCIENCE.[1]

To compare four different and carefully prepared volumes is difficult. All are well supplied with references and illustrations, and only an author can appreciate the painstaking search which these involve. James is outstanding for the many maps drawn by Raisz and for the colored maps of vegetation, climate and land forms. In quality of illustrations and printing, Finch and Trewartha takes first place, with credit to the McGraw-Hill Book Company. Bengtson and Van Royen is especially comprehensive. White and Renner is perhaps the most interestingly written, but all are well done.

The presentation of geography to general college students in one year presents several practical difficulties. Not the least of these is their almost complete ignorance of simple place information. Only a small fraction of college freshmen can identify three quarters of the states when given an outline map. The geographic void which characteristically follows the seventh grade makes it necessary to introduce material which has little place in a college curriculum. The lack of map knowledge may in part be rectified by a judicious use of Lobeck and Smith's exercises on the "Places of the World." (The Geographical Press, Columbia University).

Where it is desired to have the course stress the adjustments between man and his environment, no better volume has been written than White and Renner. Likewise, where a service course is to be presented to students of business, Bengtson and Van Royen will serve admirably. Both volumes contain enough for a year's course.

On the other hand, if the emphasis is to be on cultural geography with its consideration of the varied landscapes of the earth, the problem of a text is less simple. James is rather short and opens too abruptly. Finch and Trewartha provides the essential elements but is merely a beginning. The best arrangement would appear to be a combination of the two, with Finch and Trewartha used until Christmas or possibly for a semester, followed by James and supplementary case studies. In such a combination all regional portions of Finch and Trewartha might be deferred until later in the year. This twofold division of the year into elements and chorography is somewhat akin to the conventional organization of introductory geology into physical and historical.

In this task of understanding the face of the earth, it is at once apparent that the map is a mosaic of many thousands of communities. Fortunately these may be grouped into regions, and these in turn into realms or landscape groups. Finch and Trewartha defines six realms in terms of climate, while James describes eight groups on a basis of natural vegetation. Neither volume considers individual regions or communities, but if the course is to serve its purpose certain detailed studies would appear desirable. For these, the increasing number of field studies as published in the *Geographical Review* and the *Annals of the Association of American Geographers* provide excellent material. If the class is small, students may be sent directly to the journals, but with larger groups and for institutions with limited libraries there is need for a reference volume of selected type studies. This need is partially met by Glendinning and James's lithoprinted "Representative Regional Studies" (George Wahr, Ann Arbor), but the over-condensation and the absence of illustrations make this brief book of doubtful value. No volume can encompass the earth, but within appropriate limits it should be possible to assemble a selection of detailed studies which would bring the student into intimate contact with reality.

Where shall such a course fit into the crowded liberal arts curriculum? At Wisconsin, the course taught by Finch and Trewartha carries natural science credit; at Michigan James's course rates as a social study; at Chicago the country's oldest department has representation in both divisions. Geography is inevitably at the same time a social and a natural science, as well as an art, and it is unfortunate to insist that it be fitted into an artificial scheme of divisions. One of its values is that of a bridge between the fields which deal with man and with nature; it should not be penalized in the schedule of group requirements because of this duality. Where taught by qualified

[1] SCIENCE, 83: 15–16, January 3, 1936.

geographers, few subjects are so broadening or furnish such a perspective for the world problems of our day. At the same time, the practical applications of geographic techniques are increasingly apparent. To the furtherance of these objectives these volumes make conspicuous contribution.

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SPECIAL ARTICLES

FISH MORTALITY PRODUCED BY OXYGEN DEFICIENCY

THE writers have had various cases of fish mortality brought to their attention during this past winter and have had an opportunity to investigate one rather large and unusual situation located at the ox bow of the Connecticut River about two miles down stream from Northampton, Mass., at the confluence with the Manhan River.

The separation of this ox bow from the main stream resulted from a freshet in 1840 which shortened the channel of the river by about three miles, cutting across the narrow end as illustrated (see cut). The

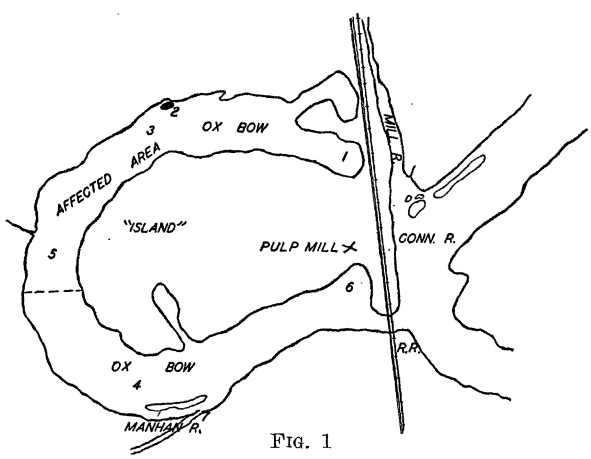

FIG. 1

Manhan joins the ox bow on the outlet side about one mile from the present junction with the Connecticut River. Several miles down stream at Holyoke, Mass., a large power dam exists that has slightly raised and sustained the general level of the river at this place.

During the past winter, the low temperatures in this locality were of quite a long duration. Still water was frozen over from early December to March 10. No thaws of sufficient intensity to break up the ice occurred during this interval.

On February 25 the attention of the writers was called to the large quantities of dead and dying fish at one small opening in the ice of approximately 250 to 300 square feet. This condition was known to have existed on February 23, when a local game warden was notified. At this place several hundred fish of various lengths and of the following species were found.[1]

[1] The writers are indebted to Dr. E. C. Driver, of Smith College, and Dr. R. E. Trippensee for additions to the list of fishes.

Ameiurus nebulosus (LeS.)	*Micropterus salmoides* (Lac.)
Eupomotis gibbosus (L.)	*Esox reticulatus* LeS.
Lepomis pallidus (Mitch.)	*Catostomus commersoni* (Lac.)
Pomoxis sparoides (Lac.)	*Anguilla chrysipa* Raf.
Perca flavescens (Mitch.)	Dace and shiners

Dead fish were observed at air-holes in other parts of the affected area. The large numbers and the wide range of species indicated that death was produced by extraneous causes. Some small fish (probably immature perch) were seen alive at the largest opening and were in no apparent distress.

Station No.	Dissolved O_2
1	0.8
2	0.8
3	0.8–1.6
4	1.6–6.0
5	0.4
6	9.8
7	7.9–8.7

Field determinations of the dissolved O_2 content of the water from February 25 to March 10 in the upper half of the ox bow (the affected area) showed 0.4 to 1.6 parts per million as opposed to 8.0 parts per million in the Manhan River. Near the junction of this river with the ox bow the dissolved O_2 varied from 1.6 to 6.0 parts per million. At the lower end of the ox bow, where the water probably was oxygenated by the Manhan and the operations of a nearby pulp mill, the waters contained 9.8 parts per million of dissolved O_2 on February 25. This last reading may have been affected by the wastes from the mill, but on the date of observation a number of fishermen were catching a few yellow perch at this place, all in apparently good condition. At no time were any dead fish found in this area. The dissolved O_2 showed diminution during the period of observation from February 25 to March 10, from 1.6 parts per million to 0.8 parts per million. The water showed a pH of 5.3 throughout, at all times.

This situation was partially relieved on March 10, because of accumulated rain water which broke through the ice, and completely relieved by the flood of the Manhan River on March 11. On March 10 the small fish formerly observed at the first opening were gone. At the time of the flooding, the extent of the