century, neither the indigenous African systems nor the grafted-on European systems are suitable, or even adequate, to continue to provide food and other agricultural products for this continent with its increasing population.

Land-use systems and techniques appropriate to the diverse and largely tropical landscapes of Africa must be developed. This is one of Phillips' main arguments. Suitable techniques can be evolved only through intensive study of the relationships of the elements of climate, soils, and vegetation in the areas to be used. The extreme diversity of climate, soil, and vegetation associations must be recognized by persons concerned with agricultural development.

Among the problems posed by these factors in Africa, Phillips cites the high humidity of the rain forests and its role in furthering plant and animal disease. High evaporation in the semiarid lands and its limiting effect on plant growth is treated. This problem, so important over the vast savanna lands, should have been handled in more extended fashion, if it is to be understood by the government officials to whom the book is largely directed. Diagrams showing monthly precipitation, potential evapotranspiration, and water balance for several stations would have clarified the matter.

Among the vegetation problems treated is that of the annual grass burning of the savannah areas, its influence on soil fertility, and its relationship to thicket encroachment.

In all of these problems the stress is on study of the ecology of areas small enough to be relatively homogenous from the viewpoint of the agriculturalist. On the basis of association of climate and vegetation, Phillips tentatively categorizes Africa south of the Sahara into more than 40 type-regions. The regional divisions are shown on an adequate map. The climate, vegetation, and soils of each region are described in some detail, as are problems of tree crop, tillage agriculture, or livestock keeping when appropriate. Present land use is described, and a statement of Phillips' evaluation of possible future use is made for each region. This part is really a handbook, and it should be read selectively. Its readability is not enhanced by the continued use of symbols or abbreviations for elements of climate, severity of ecological factors, and variations in vegetation and so forth. In this section the author brings together much material previously available only in the reports published by the various agricultural research stations and colonial departments of agriculture, and in a number of journals. This is an important contribution. By bringing together this information Phillips forces himself and us to re-examine our earlier generalizations about African land use, which were based on less comprehensive data.

The latter third of the book deals with other factors influencing agricultural development, such as human health, livestock disease, and present agricultural productivity. There is a discussion of the large development schemes including the Gezira cotton scheme in the Sudan, the groundnut scheme in Tanganyika, and the proposed Volta River scheme in Ghana. Phillips argues that large schemes should be undertaken only after extensive examination of the ecological problems of the area to be developed.

This book could only have been written by an agricultural scientist with extensive field experience in Africa and a wide acquaintance with the literature from the numerous agricultural research centers in Africa. It should be of service to scholars of other disciplines and to the political leaders of the emerging African states.

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Wave Propagation in a Random Medium. Lev A. Chernov. Translated from the Russian by R. A. Silverman. McGraw-Hill, New York, 1960. viii + 168 pp. Illus. $7.50.

This is the first more or less complete account, in English, of the theory of wave propagation in random media. The results are necessarily specialized to perturbation solutions of one kind or another since closed-form solutions of the equations are unattainable.

The many detailed calculations include solutions based on the ray theory, valid when the scale of inhomogeneities is large compared with the wavelength; first-order perturbation solutions of the wave equation; and the effects of fluctuations of the medium on the focusing properties of optical systems. Of special interest is a section on the deviation of rays treated by means of the Fokker-Planck equation, a technique developed by the Russian school. Many detailed results on the correlation of fluctuations in the phase and amplitude of waves in inhomogenous media are derived by means of a straightforward application of first-order perturbation solutions of the wave equation.

One chapter is devoted to experimental data; this is surely too little for adequately describing the wide range of potential applicability of this theory. Chernov mentions American contributions to the subject which were made up to around 1954, but there has not been much of outstanding interest published since that time. This book is at present the only one available in English on the subject, and it is a valuable account of a theory which is not widely taught in America.

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The Search for New Antibiotics. G. F. Gause. Yale University Press, New Haven, Conn. 1960. 97 pp. Illus. $4.75.

This book is the record of the "Trends in Science" lectures given at Yale University, in December 1959, by Professor G. F. Gause (Institute of Antibiotics, Moscow). It consists of three lectures. The first, on the distribution of antibiotic-producing microorganisms, presents Soviet evidence that there are a greater number and a greater variety of kinds of microorganisms in the soils of the South than in those of the North, and discusses the idea that geographic factors are a controlling determinant of the distribution of antibiotic-producing organisms. The second lecture emphasizes the importance of the early classification of any unknown microorganisms producing antibiotics as an index of the type of antibiotic it is producing. The argument is less firmly grounded than that for distribution, and reflects a prevalent opinion in the Soviet Union on a somewhat controversial position.

The third lecture is on the use of microorganisms in cancer research. It is first concerned with the problem of whether "equivalents" to cancer exist in microorganisms. Such equivalents are thought to be found in certain (but not all) respiratory-deficient mutants of yeasts, molds, bacteria, and protozoa; methods are described for obtaining the proper types. While this approach is

highly dependent upon the idea that the cancer is a cancer *because* of impaired respiration, Gause presents evidence that biological alkylating agents—actinomycin c, a new antibiotic "6270" having antitumor activity, 6-mercaptopurine and relatives—are much more active in inhibiting such respiratory-deficient strains than they are in inhibiting the parent strains. In short, evidence is presented that agents having antitumor activity inhibit the respiratory deficient strains without comparable inhibition of the parents, and that materials without antitumor activity inhibit both types of strains equally, if at all. Therefore, such mutants can be employed as detectors for potential antitumor agents.

The lectures are intelligently conceived, well organized, in excellent English, and attractively printed.

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Die Natur im Weltbild der Wissenschaft. Walter Hollitscher. Globus Verlag, Vienna, Austria, 1960. 499 pp. Illus.

This is a concise and well-rounded presentation of the fundamentals of natural science, written by a faithful Marxian for faithful Marxians. The book will also be interesting and useful to those non-Marxians who wish to study this perplexing phenomenon—Marxist science on this side of the Iron Curtain. Roughly the first quarter of the book gives an outline of the history of science; the second quarter is an account of physics, astronomy, and cosmology; the third presents the biological theories of evolution, heredity, and development; and the fourth deals with human evolution, Pavlovian psychology, and population problems. The tone of the book is set in the opening chapter by quotations from these great *scientific* authorities—Marx, Lenin, Mao Tse-Tung, and Engels. Marx and Engels are, indeed, the most frequently quoted authorities, followed by Lenin, Darwin, Haldane, Needham, Pavlov, and Ambarzumian.

The book is written interestingly and well; whether it presents an accurate and fair account of the topics with which it deals is a different question. I derived some wry amusement from the author's valiant but unsuccessful efforts to pay due homage to Michurinist biology without making himself thoroughly ridiculous. The technique adopted is to say that recent developments in biology make the gene theory pretty much indistinguishable from the Michurin-Lysenko teachings. Both are misrepresented in the process. But, after all, the value of the book is in the light it throws on Marxist science, not on science in general.

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Frontiers of the Sea. The story of oceanographic exploration. Robert C. Cowen. Doubleday, New York, 1960. 307 pp. Illus. $4.95.

To cram a readable account of the oceans into 307 pages is a man-sized job, and Robert Cowen has handled it well. The publisher, or whoever is responsible for such things, let three typographical errors creep in, but for a book that sells for less than $5 these days, one can be lenient and note such errors only in passing.

The book contains a concise history of oceanography and a report on nearly all major phases of work at sea: bathymetry, biology, currents, tides, and food, as well as an account of the most recent discoveries and developments (the author is very up to date). He has included 16 pages of excellent photographs; these are placed in groups of eight at intervals approximately one-third and two-thirds of the way through the book. Fifty-four line drawings by Mary Cowen add considerably to the book's charm. It is pleasant to see good hand sketches of currents, instruments, charts, fish, and plankton.

There is an introduction by Roger Revelle which is "up to snuff," endpaper charts at front and back, a briefly annoted bibliography listing 18 volumes that are well-worth reading, and what appears to be a good index (six and a fraction pages). I read the book rather carefully in about 6 hours.

There are a few statements or implications in the book which bear further discussion. Cowen states on page 74 that "much of the recent detailed data on undersea topography has been kept secret . . ." This was true until quite recently when the Navy's classification of bottom topography was brought up to date; this involved considerable declassification.

In his discussion of coral atolls, Cowen implies that the drillings on Bikini and Eniwetok were connected with bomb tests. They were only in the following way—the Bikini drilling was part of a general resurvey made in 1947, one year after "Operation Crossroads"; the Eniwetok drilling was convenient because the impending H-bomb test made logistic support available. Both atolls were drilled primarily for scientific purposes.

On page 181 it is indicated that coal and oil might form in deep water, although I do not believe that implication is intended. These products are certainly formed in shallow water. Similarly, on page 212, it is indicated that the vertical migration of plankton has been studied for the last half century, but it seems to me that knowledge about this phenomenon is of recent origin.

In the brief treatment of recent international affairs in oceanography (in the eleventh and final chapter), Cowen states that the Special Committee on Oceanic Research (SCOR) is a Committee of the International Geophysical Union (more correctly the International Union of Geodesy and Geophysics, IUGG). This a mistake. SCOR is a creature of the International Council of Scientific Unions (ICSU) of which the IUGG is also a member. Representatives are sent to SCOR from IUGG and from several other scientific unions that are members of ICSU.

It would have been useful if, in the section on tides, Cowen had included the seasonal exchange of sea water between the northern and southern hemispheres. However, this recent discovery, further checked during the IGY, is still not fully understood and perhaps would be better discussed at a later date.

The general sense of the volume, that the oceans are simply waiting for us to utilize them fully, is good. In gradual, but ever-increasing tempo, many agencies of the federal government are emphasizing research and exploration at sea. It is an investment in the future which we cannot afford to miss and which, indeed, we are not going to miss. The value of the oceans is fully brought out in this book.

Frontiers of the Sea will be worthwhile reading for the interested and lay public, for whom it is intended. By keeping the public accurately informed, Cowen has given important help to those who must determine that the United States does not lag in its scientific development.

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