physicists are attracted to chapters with titles like "Color vision," "Electrical charges on bacterial surfaces," "Radiation effects on DNA synthesis," "Nerve transmission," and "Sound wave reception." On the other hand, chemists tend to favor subjects such as "Biosynthesis of protein" and "The physical chemistry of DNA." Physiologists should approve highly I. M. Glynn's critique "Ionic permeability of the red cell membrane."

The editors, J. A. V. Butler and B. Katz, state in their preface, "There is no need to apologize for the diversity of this biophysical menu." They hope their collection will "help provide a meeting ground for all those scientists, who in spite of their very different methods of approach, are concerned with the applications of physical principles to biology." In my opinion, biophysics as a branch of science is still not very secure. In fact this volume could, with seemingly equal justification, be issued under several other titles, such as "Recent Progress in Physiology," or "Recent Progress in Biochemistry," or simply "Progress in Biology." It is noticeable that many references are to work done before 1940. The illustrations are good but scanty.

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Ozeane Salzlagerstätten. Grundzüge der Entstehung und Metamorphose ozeaner Salzlagerstätten sowie des Gebirgsverhaltens von Salzgesteinsmassen. Hermann Borchert. Borntraeger, Berlin, 1959. 237 pp. Illus. DM. 48.

The Permian salt beds of central Germany have long been famous, not only as a source of potash but as a beautifully clear example of the usefulness of physical chemistry in the solution of geological problems. The painstaking work of van't Hoff and his colleagues, at the beginning of this century, on equilibria in saturated salt solutions made it seem probable that the history of the salt beds could be reconstructed in a fairly simple fashion, by the evaporation of enormous quantities of sea water under geologically reasonable conditions. Further investigation showed that this simple picture was inadequate, and during the past 50 years both chemists and geologists have tried to work out the necessary modifications. During this period, also, other extensive deposits of potash salts have been discovered—in England, Russia, the United States, and Canada—with characteristics even less consistent with van't Hoff's simple hypothesis. Inevitably, the subject has grown exceedingly complex and has been cloaked with a special nomenclature and a number of conflicting hypotheses that pose a formidable barrier to understanding by nonspecialists.

By far the best recent attempt to summarize current thinking on salt deposition is contained in a book published 2 years ago—*Steinsalz und Kalisalze,* by Franz Lotze. This volume is a comprehensive account of all kinds of salt deposits, and the space devoted to the German potash beds is necessarily limited. The author of the book under review explains in his introduction that he is setting out to amplify Lotze's treatment of marine deposits and to place in what he considers a fairer perspective certain theoretical ideas that Lotze passes over lightly. For the nonspecialist, therefore, the book is difficult reading because it assumes a knowledge of Lotze's previous work—as well as an intimate knowledge of German geography and geology. The book also taxes its readers' ability to maintain an unbiased viewpoint, because in it Borchert is frankly emphasizing the theoretical ideas which he considers important—ideas to which he himself has made fundamental contributions in a series of papers extending over many years.

In reconstructing the probable environment of original deposition of the German salt beds, Borchert envisions a time of hot-arid climate, when northern Germany was closer to the equator than it now is. The salts were laid down in a deep basin of partly stagnant water, much like the present Black Sea, separated from the open ocean by a series of bars and shallow lagoons; excessive evaporation in the basin caused inflow of sea water, the rate of inflow having changed from time to time in response to fluctuations of climate and to minor ups and downs of the bars. This reconstruction differs only in detail from the usual textbook picture. Some such mechanism for the addition of fresh sea water over an extended period of time has long been recognized as necessary to account for the extraordinary thickness of the salt beds.

The sequence of salts that would be expected as primary precipitates in this kind of situation can be worked out, as Borchert explains in detail, from experimental results on simple salt systems. The correspondence between prediction and mineral associations actually observed is sufficiently close so that the German salt beds were long taken as a classic example of primary precipitates only slightly modified after deposition. In detail, however, the sequence of salts departs in many respects from predictions based on experiment, and the discrepancies persist despite many attempts to modify the postulated conditions of precipitation. Probably most salt geologists would now agree with Borchert's conclusion that the Stassfurt beds look like a simple depositional sequence only by accident, and that other processes besides deposition from an evaporating brine must be invoked to explain their origin.

Borchert ascribes the lack of agreement between experiment and observation to three principal factors. First is the probability that strong temperature gradients existed within the basin of deposition, or between the basin and the marginal lagoons; such gradients, as Borchert himself has demonstrated experimentally, would lead to preferred deposition of different salts in the hot and cold areas and to broadening of the fields of stability for some salts. Second, burial of the primary salts beneath later sediments would lead to a rise in temperature and hence to progressive metamorphic changes in the salt minerals; Borchert differs from most other salt geologists in emphasizing the stepwise character of the metamorphism and in ascribing the metamorphism chiefly to fluids derived from the salts themselves —especially to water set free in the conversion of thick beds of gypsum to anhydrite. The third kind of change that affects the primary salt precipitates is "reverse" metamorphism brought about by dilute solutions from outside the salt beds, either surface water percolating downward or volcanic water coming from below. The variations in mineral association made possible by deposition in a temperature gradient and by the two kinds of metamorphism are so numerous that, in Borchert's opinion, a complete reconstruction of salt-bed history on the basis of physical chemistry and mineral association alone is impossible. Additional information can be obtained, however, from textures and from horizontal and vertical changes in mineral association, and by use of such data the history of any well-explored salt accumulation can be worked out.

Much of the book is devoted to examples of the application of these ideas to specific areas. The examples are taken

largely from the German salt deposits, about which a great wealth of descriptive information is available, but Borchert makes frequent allusions to potash deposits elsewhere for purposes of comparison. The treatment of many examples from different points of view makes the book seem repetitious, but the author is frank to say that the repetitiousness is deliberate. It does have the effect, as he hoped it might, of making his major ideas clearer and more forceful than they would be in a single statement.

The last part of the book is ostensibly a discussion of the mechanics of deformation of salt deposits. The emphasis, however, is chiefly on experimental work concerned with the deformability of salt crystals and crystal aggregates under a variety of conditions—experiments to which Borchert has made important contributions. Wisely, the author does not try to rival or to duplicate the excellent discussion given by Lotze of large-scale deformation structures in salt deposits.

One may object that the book in some measure belies its title, for it is certainly not a general treatise on marine salt deposits. One may question the author's seeming lack of generosity toward viewpoints that differ from his own—for example, "Failure to think through all these possibilities, combined with uncritical interpretation of field observations, still gives rise to endless discussions . . ." (reviewer's translation). One may wish, from the point of view of a foreign reader, that the author had described more fully the way various controversies have arisen and have developed. But within the limits of what he set out to do, Borchert has made a notable contribution to the literature on the origin of salt deposits. He has summarized his own work and his own ideas very clearly and has provided voluminous evidence for the correctness of his theories.

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A Course of Pure Mathematics. G. H. Hardy. Cambridge University Press, New York, ed. 10, 1959. xii + 509 pp. Illus. Student's edition, paper, $3.75.

This book occupies a special niche in my heart, since it was used in the first course in mathematics that I attended as a graduate student, in 1917. That text was the first edition (1908), and the book under review is the tenth edition (1959). The book has been revised several times, but only in detail, to include newer concepts and proofs. The chapter titles and illustrations are intact, and so is the original flavor. Hardy always felt it necessary to defend the study of pure mathematics against those for whom mathematics is merely a tool; as this attitude was particularly prevalent in England in 1908, this book was written more or less in a spirit of evangelism. This tenth edition, now in its third printing, was brought out after Hardy's death in 1947 by several of his former colleagues at Cambridge University, among them J. E. Littlewood, and it is greatly to their credit that the enthusiastic style of the original has been preserved.

The book corresponds most closely with texts of advanced calculus in our American hierarchy of course titles, but one can learn much algebra and real and complex variable theory from it. It is 50 years old, and its hair is beginning to gray in places, but it is a fascinating book. With its wealth of problems, it is well suited to the needs of a student who must work by himself, without lectures. This, you must agree, is high praise.

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The Aztec: Man and Tribe. Victor W. von Hagen. New American Library, New York, 1958. 222 pp. Illus. + plates. Paper, $0.50.

Mexico and the adjacent portions of Central America provided a varied geographical background for the development of an exceedingly interesting type of American civilization, which disintegrated under the impact of the Spanish conquest in the 16th century. Within the "Mesoamerican" region various subcultures have been distinguished by a combined archeological and ethnohistorical approach, the Maya and Aztec being the best known. The time period extends back to well before Christ.

Von Hagen's "paperback" undertakes to reconstruct Aztec culture, which appeared late, devoting suitable attention to its time-space relationships with its neighbors. It is planned for the general reader. The text is broken up into 32 short chapters, each with its own title, grouped under four major headings: "Historical and geographical background," "The people," "The Aztec 'kings' and directing classes," and "The achievements." In chapter 1 the author explains his long-time interest in ancient American civilizations and briefly reviews the roster of past contributors to our knowledge of these civilizations. He explains his approach thus: "In this book I, as author, have leaned heavily on much of this literature of the five centuries. I have attempted ('according to my character and idiosyncrasy,' to paraphrase the *Gardens of Epicurus,* 'of my own taste and fancy—in a word, as an artist') to select what I regarded as pertinent."

There are a good many literary allusions scattered through the text, as well as world-wide generalizations relative to specific Aztec traits which do not appeal to me, for my bias is that of an archeologist too close to minutiae. In general, the work seems acceptable as a popularization of the subject, and it does not seem to depart in important respects from the late George C. Vaillant's more or less standard *The Aztecs of Mexico* (1941). It is worth noting here that this is still readily available as a 1951 paperback reprint, with a "Postscript" by C. A. Burland on important archeological findings as of the reprint date.

I think that Vaillant's book will remain a better choice for textbook use. Its photographic coverage is much fuller, it provides a much more extensive bibliography, and there is a series of footnotes packed with sound scholarship. Von Hagen's "Bibliography and notes" provide valuable thumbnail descriptions of some 30 sources, but the notes seldom lead one to anything specific.

Human behavior is enormously complex, and in any such works as these inference and opinion lie behind much that must be, perforce, stated as fact, and a plain mistake or two is bound to creep in. The short chapter on the ancient calendar needs revision in this respect.

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The Onset of Stuttering. Research findings and implications. Wendell Johnson *et al.* University of Minnesota Press, Minneapolis, 1959. ix + 243 pp. Illus. $5.

The present volume is the latest in a long list of notable publications by its major author on the subject of stuttering. Johnson holds a position of preeminence in this field, and whatever he