must be kept in mind not only for the analysis of any one faunal assemblage but ultimately for comparison of assemblages on a worldwide basis. For this reason Lawrence has made a plea for standardization in identification and analysis so that valid intersite comparisons can be made. She suggests that reports on faunal remains include an account of the archeological techniques used to obtain the samples and that there be a uniformity in both qualitative and quantitative criteria for identification. In addition to identifications other data should be recorded, such as location of each skeletal element in the site, age and when possible sex of each animal, type of bone fragments, and modification of bone as by butchering. She further suggests that a data retrieval system would facilitate intersite comparisons. Since the presentation of this paper several museums in the United States and Europe have started data retrieval with the Selgem computer system. This system could facilitate comparisons on a very large scale, but the caution Lawrence presents must still be kept in mind and the data entered into the memory storage be made uniform. This approach and the data and methods presented in this volume offer hope that we may build on this foundation to gain greater understanding of and historical perspective on human use of animal resources.

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Mechanisms of Hearing

The Auditory Periphery. Biophysics and Physiology. PETER DALLOS. Academic Press, New York, 1973. xii, 548 pp., illus. $32.50.

The Auditory Periphery deals with the middle ear and the cochlea of the inner ear. The discussion of neural processes in the acoustic part of the eighth nerve is limited almost entirely to the whole-nerve potentials. The main part of the book concerns the mechanics of the middle ear and of the cochlea, the electrical potentials that have been recorded in the latter, and the associated biochemistry. Separate chapters are devoted to nonlinear distortions that have been studied in both the middle ear and the cochlea, but predominantly in the latter, and to feedback mechanisms both in the middle ear muscles and in the olivocochlear crossed and uncrossed efferent systems. These are preceded by a short overview of the auditory system and by a longer overview of the anatomical macro- and microstructures of the auditory periphery. At the end of the book the reader will find a welcome summary that may help him to order in his head the vast and sometimes confusing material of the volume.

Study of the auditory periphery requires a multidisciplinary knowledge including acoustics of audible sound and some mechanics, hydrodynamics, electronics, and biochemistry—all that coupled to knowledge of relevant anatomy and some fields of mathematics, such as algebra and calculus of complex variables. Dallos has not shunned any of these disciplines. The result is the most complete description of the auditory periphery written thus far by a single author. Dallos's attempt at integrating mathematical theory with experimental data is particularly noteworthy. Although the execution of this integration may be criticized on several points, the break it makes with the prevalent conservative tradition of keeping auditory processes within the easy fold of descriptive science is of importance.

The book clearly fills part of a void that has persisted in auditory science for many years. To my knowledge there has been no comprehensive textbook on the auditory periphery since S. S. Stevens and H. Davis wrote their classic *Hearing*, which was published in 1938. About 150 pages of that volume were devoted to the subject matter of Dallos's book, which has over 500 pages. To some extent the additional pages reflect the growth of our knowledge.

Unfortunately, the correlation between the state of our knowledge and the number of pages in Dallos's book does not appear to be close, especially if we regard knowledge as understanding rather than as accumulation of data. The implied criticism is aimed at least in part at the state of auditory science. Because of many missing pieces of experimental evidence, speculation often replaces tight logical deduction. In several places the book reflects this situation and presents long-winded arguments and counterarguments that consume many pages and tend to obscure the solid knowledge that is available. The problem is compounded by a style of writing studded with redundancy and repetitious statements. More thorough editing could have improved readability and decreased the length. If it were applied also to mathematical equations, it would have eliminated some trivial errors and ambiguities.

In addition to the editorial shortcomings the book contains some substantive errors. For instance, part of the mathematical analysis of cochlear hydrodynamics at low sound frequencies is clearly fallacious, and the analysis of the recorded whole-nerve action potentials appears inaccurate.

On the whole, however, the book is an impressive piece of work containing multidisciplinary information in satisfying depth. It should be of substantial help to all those who teach auditory science and to all those who want to learn it at a reasonably sophisticated level.

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Mineralization Processes

Calcium and Phosphorus Metabolism. JAMES T. IRVING. With chapters by Felix Bronner and Gideon A. Rodan. Academic Press, New York, 1973. x, 246 pp., illus. $15.

This monograph summarizes current understanding of the physiology of calcium ion and inorganic phosphate primarily in relation to the mineralization of the hard tissues, bones and teeth, with major emphasis on application to man. It is in the main authored by James T. Irving with a chapter on "Kinetic and cybernetic analysis of calcium metabolism" by Felix Bronner and one on the "Cellular functions of calcium" by Gideon A. Rodan. This last chapter is the only part of the book that discusses the role of calcium ion in biologic functions other than the formation of mineralized tissues. In view of the multiplicity of cell functions that require or are affected by calcium ion, this chapter can only touch on a few major physiologic problems, such as the role of calcium in nerve excitation and muscular contraction. The function of calcium ion in the secretory activity of endocrine and exocrine glands is not included.

The author has chosen to deal with the extensive literature on the physiology of calcium and inorganic phosphate in the style of an *Annual Reviews* chap-

ter, namely by brief references to as much of the literature as possible with a minimum of interpretation or expression of an editorial position. Since there are no tabulations of data, diagrams, or formulas except in the chapter by Bronner, this is a difficult text to read and absorb. It does provide an extensive bibliography so that the reader can go to the primary sources to try to resolve the apparently contradictory results which are juxtaposed without definitive interpretation.

As is commonly the case in reviews of calcium and inorganic phosphate homeostasis, much more attention is given to calcium than to phosphate. The role of the kidney in the control of inorganic phosphate concentrations is only briefly reviewed, with no mention of the significance of defects of renal tubular reabsorption of phosphate as a major cause of hypophosphatemic rickets and osteomalacia. The more recent work on vitamin D and renal tubular reabsorption of phosphate is not included, so that the action of vitamin D on the kidney, which has now been confirmed, is left in doubt.

Bronner's chapter on calcium kinetics is a well-organized discussion which presents the physical and mathematical basis for the use of calcium isotopes in the estimation of the movement of calcium into and out of body compartments, particularly the skeleton. This technique has not been as productive in the explanation of clinical disorders of skeletal mineralization as had been hoped. In the past decade the most dramatic additions to our knowledge of the physiology of calcium and inorganic phosphate and of the control of bone mineralization have come from the more traditional biochemical and physiological investigations.

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