it as well as those of several other analysts who have proposed modified techniques. Two chapters are taken up with the therapeutic consequences of a defensive stratagem encountered in some patients: bringing in material from a period in their lives earlier than the time of the pathogenic experiences. The devices of cutting down the frequency of appointments or temporarily interrupting the treatment help overcome this obstacle, Alexander says.

One of the most interesting parts of the book is the collection of answers to a brief questionnaire that Alexander sent to a number of the leading figures in psychiatric and psychoanalytic education. These contain many thoughtful statements about the difficulties of sensibly differentiating the teaching of psychiatric residents and of psychoanalytic candidates. Now that psychoanalytic theory is such an integral part of psychiatry, a number of teachers frankly bring into the open their doubts about present traditions and methods of training for psychoanalysis and psychotherapy, and a few of them point out the need for better research training in these fields.

On the whole, the book will be of most interest and value to psychoanalysts and psychotherapists who are concerned with understanding their techniques of treating patients and training future colleagues. The onlooker from other disciplines who is primarily interested in the scientific and theoretical aspects of psychoanalysis and psychotherapy will find little here that is directly nutritive, although there is a good deal that can help him to understand the idiosyncrasies of psychoanalysis as a science.

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**Bacterial Anatomy.** Sixth symposium of the Society for General Microbiology held at the Royal Institution, London, April 1956. E. T. C. Spooner and B. A. D. Stocker, Eds. Cambridge University Press, Cambridge, England, 1956. 360 pp. Illus. + plates. $6.

This book is a stimulating addition to the literature. It is technically descriptive, analytic, and often provocative, according to the spirit and wit of the individual and highly competent authors. The 15 articles were published before the symposium, so that discussion could be the main business of the meeting. The book could well serve to repeat the original and admirable intent of the society as a basis for discussion in many laboratories around the world.

The first half of the book might be considered an extension of the initial symposium of the series [*The Nature of the Bacterial Surface* A. A. Miles and N. W. Pirie, Eds. (Blackwell, Oxford, 1949)] and reflects much of the most provocative ensuing work on superficial structures—for example, flagella (B. A. D. Stocker). Contributions on the characteristics and capabilities of protoplasts (C. Weibull and K. McQuillen), osmotic regulation (P. Mitchell and Jennifer Moyle), the nature of cell walls (M. R. J. Salton), and an ingenious immunological analysis of the distribution of constituents in complex capsules (J. Tomcsik) clearly underline a current direction of attention to the physical and chemical nature of cell surfaces and to the definition of the structure and functions of these regions. These lucid articles represent analytic approaches, mainly biochemical, with important structural overtones. A description of the crystalloid protein and other inclusions found in certain *Bacillus* sp. during sporulation is a fascinating contribution (C. L. Hannay) and points to new areas of study. The toxic role of these inclusions in insect disease has been demonstrated.

The complex and often confusing literature on the form and division of bacterial chromatin structures is considered in two vigorous and philosophically dissimilar articles. On the one hand, C. F. Robinow describes the behavior of chromatin bodies, discusses their cytological status in general biological terms, and argues strongly for differentiation (in properties, behavior, and descriptive terminology) of chromatin bodies from analogous organelles in most other kinds of cells. On the other hand, E. D. DeLamater assumes the acceptability of a mitotic process of chromosomal separation in a bacterial nucleus, describes his observations in those defined terms, and cites synchronization experiments, which he feels support his case. Helpful for those following these differences of approach and interpretation is an appended section to Robinow's article examining "the alleged evidence of mitosis in bacteria." One might have hoped that the general article on "Chromosomes in micro-organisms" (C. G. Elliot) would give a more useful perspective from outside the field of battle, but the pronouncements are not particularly illuminating.

The uncertainties of preservation involved in preparation for ultrathin sectioning and electron microscopy are clearly defined by O. Maaløe and A. Birch-Andersen. These authors describe a new epoxy resin imbedding technique that may be of good use. Their paper and the deceptively persuasive prose of J. R. G. Bradfield concerning cytoplasmic organization really emphasize that we are not yet in a position to interpret the fine structure of the bacterial protoplast, but they are nevertheless helpful assessments of our current state.

This book will be a source of information and enjoyment to bacteriologists, to the biologist who would like to examine "the resemblances of things," and to the advanced student who would like to stray from the strict confines of course-work.

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**Ultrasonic Engineering with Particular Reference to High Power Applications.** Alan E. Crawford. Academic Press, New York; Butterworths, London, 1955. x + 344 pp. Illus. $8.

This book contains a survey of current practice in the use of vibration, sound, and ultrasonics of high amplitude for practical purposes. It also provides a review of pertinent scientific literature, suitable for orientation of the would-be user. An extensive, but nevertheless carefully selected, bibliography follows each chapter.

The author is successful in presenting a large amount of useful and interesting material at a satisfying scientific level without use of mathematics beyond simple algebra. Two chapters contain general introductory acoustical facts and a 20-page discussion of cavitation phenomena. In four chapters a good deal of practical data is given on transducers and generators now in use. Six chapters treat applications of high-amplitude sound and ultrasonics; detailed information is given on *precipitation and agglomeration, emulsification and dispersion, chemical applications, metallurgical applications, coating of metals* (*soldering*), and *biological applications.* A final chapter treats applications of sound for measuring and testing (rather than producing changes in) materials.

This book will be a very good one for that wide audience of persons, not specialists in acoustics and ultrasonics, who wish to know the possibilities of high-amplitude sound for their application. The specialist will also find much useful information here but will want to complement this source with others, especially for the necessary mathematical theory.

A small lament might be entered. The title follows a common departure from standard terminology in its use of the adjective *ultrasonic.* The latter should refer to sound whose frequency is above the audible range, whereas the subject of this book naturally involves sound of *all* frequencies, since many of the effects

discussed occur just as well at low frequencies as at high. The qualifying adjective needed is one indicating sound whose *amplitude* is high. Pending standardization of such an adjective (*hypersonic* and *macrosonic* have been suggested), it appears necessary to refer to an agent identified somewhat prosaically as "high-amplitude sound."

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**The Myology of the Whooping Crane, Grus americana.** Illinois Biological Monographs, vol. XXIV, No. 2. Harvey I. Fisher and Donald C. Goodman. University of Illinois Press, Urbana, 1955. 127 pp. Illus. Cloth, $3.50; paper, $2.50.

It is curious indeed that, although birds are probably better known taxonomically than any other group of animals, and although descriptive and comparative anatomy are among the oldest of the zoological sciences, the anatomy of birds is poorly known. It has been generally assumed more or less tacitly that all birds are essentially alike under the skin. As a matter of fact, as the authors of the present book observed, the musculature of only one bird, the raven, is known with any degree of completeness, and this description dates back to 1890. The lack of anatomical information about birds is all the more extraordinary because detailed studies about other kinds of vertebrates have proved invaluable in unraveling fundamental relationships. In view of the scarcity of bird fossils, such an approach would seem especially fruitful for students of avian phylogeny. It is thus gratifying that two competent investigators undertook a study of the myology of the whooping crane. Because the whooping crane seems destined for extinction in the near future, the work of Fisher and Goodman is timely, to say the least.

*The Myology of the Whooping Crane,* Grus americana is based on the dissection of three specimens, none of which was killed specifically for anatomical study. The bulk of the book is devoted to the detailed description of the crane's musculature. There follows a short "Discussion." The discussion, however, consists primarily of a summarization of the salient details of the text proper. The lack of a definitive interpretation of the findings is regrettable, but certainly understandable since this is virtually a pioneer study. Happily it sets a high standard for others to follow.

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**The Biology of Senescence.** Alex Comfort. Rinehart, New York, 1956. xiii + 257 pp. $4.

This book is a greatly expanded form of Alex Comfort's article, "Biological aspects of senescence" [*Biol. Revs. Cambridge Phil. Soc.* **29**, 284 (1954)]. In my opinion Comfort has made the first partial success in bringing together in a very readable and logical form the mass of biologic research in aging. The author acknowledges the fact that the book is incomplete; even so, the collating and attempts at evaluation of a large number of papers have presented to the investigator several problems that must be solved in order to get a proper picture of biologic aging.

A discussion of the attempts to measure senescence arrives at the conclusion that, at present, no method is satisfactory. The discussion concerning the distribution of senescence is very well developed, and most of the known information on various life-forms has been included. However, I have some doubt as to the value of this type of work in research in aging—but I keep asking myself this question: "Let us assume that we know the normal life-span of every life-form, its maximum found in nature per se, and the average under natural and laboratory conditions. How does this aid us in studying the processes of aging?" The treatment of senescence in protozoans has always been fascinating, and the effects of genetics on life-span certainly point to possible human application and interpretation of work in this field.

In the latter half of the book, Comfort gets down to our primary interests in discussing the work on growth and senescence and, the most interesting of all to me, the various mechanisms of senescence. The general conclusion may be that we must know a lot more before we can say "this is how an animal grows old." The problem of *why* is intimately bound up in the bioenergetic relationships of cells, tissues, and organs. The animal ages as a whole, but it is possible that the real mechanisms may lie in cellular aging.

Comfort is reserved in most of his conclusions, and his book is a must for any investigator in the fields of biologic aging. Comfort suggests that if nothing else of value comes from the book, the references will be useful. I am willing to go further and state that a careful reading of his book will help in organizing one's own knowledge and viewpoints in aging—not that I agree with him all the time, for this is asking too much of any book or any investigator.

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## Miscellaneous Publications

*(Inquiries concerning these publications should be addressed, not to* Science, *but to the publisher or agency sponsoring the publication.)*

*Research at Cornell.* Annual report of the vice president for research 1955–56. Cornell University, Ithaca, N.Y., 1956. 48 pp.

*Twentieth Semiannual Report of the Atomic Energy Commission, July 1956.* U.S. Atomic Energy Commission, Washington, D.C., 1956. 260 pp.

*The Concept of Entropy in Communication, Living Organisms, and Thermodynamics.* Research Ser. No. 130. Y. S. Touloukian. Purdue University Engineering Experiment Station, Lafayette, Ind., 1956. 66 pp. $1.

*Fossil Mammals of Africa.* No. 9. *A Miocene Lemuroid Skull from East Africa.* Wilfrid Le Gros Clark. British Museum (Natural History), London, 1956. 6 pp. 5s.

*Atomic Energy of Canada Limited, Annual Report, 1955–56.* Atomic Energy of Canada, Ltd., Ottawa, 1956. 20 pp.

*Reproduction and Infertility.* Physiology, anatomy, pathology, biochemistry. 27–29 June 1955, Michigan State University Centennial Symposium, sponsored by the College of Veterinary Medicine Agricultural Experiment Station, Michigan State University, East Lansing, 1956. 112 pp. $3.

*Scientific Research Progress in Mellon Institute 1955–56.* Annual Rept. Ser. No. 43. Annual report of the president, Edward R. Weidlein, to the board of trustees of the institute, for the fiscal year ended 29 Feb. 1956. Mellon Institute, Pittsburgh, Pa., 1956. 54 pp.

*A Study of the Distribution and Taxonomy of the Percid Fish Percina Nigrofasciata (Agassiz)* Tulane Studies in Zoology, vol. 4, No. 1. Tulane University, New Orleans, La., 1956. 55 pp. $0.75.

*The Upper Paleocene Mammalia from the Almy Formation in Western Wyoming.* Smithsonian Misc. Coll., vol. 131, No. 7. C. Lewis Gazin. Smithsonian Institution, Washington, D.C., 1956. 18 pp.

*Grain Research Laboratory, 1955 Report,* J. Ansel Anderson. Board of Grain Commissioners for Canada, Winnipeg, Manitoba, 1956. 77 pp.

*A Classification of the First Instar Larvae of the Meloidae (Coleoptera).* Univ. of California Publ. in Entomology, vol. 12. J. W. MacSwain. University of California Press, Berkeley, 1956. 149 pp. $3.

*Teachers of Children Who Are Deaf.* Bull. 1955, No. 6. A report based on findings from the study "Qualification and preparation of teachers of exceptional children." Prepared by Romaine P. Mackie *et al.* U.S. Office of Education, Washington, 1956 (order from Supt. of Documents, GPO, Washington 25). 87 pp. $0.35.

*Observations on the Autecology of Heliotropium Europaeum L. in New South Wales and Victoria.* Div. of Plant Industry Tech. Paper No. 7. C. W. E. Moore. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, 1956. 12 pp.