J. M. Tanner's work on human constitutional variation and morphology to the experimental, laboratory studies of Barnicot on human pigmentation. There is an emphasis on morphological and anatomical studies which is not surprising, since Weiner, Le Gros Clark, and Tanner are the principal contributors within the field of physical anthropology. One welcomes the extended discussion of research in human population genetics and its role in our science, as presented by Penrose, Stevenson, Mourant, and Barnicot. The interests of the latter in laboratory and experimental studies is especially important at this stage in the growth of physical anthropology.

Two significant topics treated in the hortatory parts of the symposium are physical anthropology as a liberal discipline (J. Z. Young) and the design of "dream" curricula (Tanner and Weiner). Cellular biology—something of a fad at the moment—finds a place even here in a discussion of human biology and medicine (Tanner).

I am disappointed that this publication fails to note important new research areas in physical anthropology. The implications of recent discoveries in human biochemical genetics (the haptoglobin alleles, hemoglobin variants, Gm serum groups, beta-globulin alleles, white-cell antigens) for the training of students and the organization of laboratories are neglected. There is little awareness in the formal papers (the discussions are not included in the volume) that our discipline encompasses the genetics and morphology of nonhuman primates.

The symposium is directed particularly to British problems, and some of the proposals are not necessarily relevant outside Great Britain. Despite these reservations, this book ably demonstrates that British physical anthropologists living in the middle of the 20th century also practice 20th-century science.

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Amid Masters of Twentieth Century Medicine. A panorama of persons and pictures. Leonard G. Rowntree. Thomas, Springfield, Ill., 1958. xviii + 684 pp. $11.50.

The subtitle, "A panorama of persons and pictures," expresses fairly well the nature and content of this highly personalized book. The author, a distinguished physician and now emeritus professor, reminisces on men and events from associations developed during an academic career of some 50 years spent largely at Johns Hopkins Medical School and as chief of medicine at the Mayo Clinic. The attempt—apparently inspired by remarks in one of Winston Churchill's books—is to present the medical developments of the past half century from the viewpoint of a participant. In fact, quoting from Churchill, the author has sought to emulate the method employed by Daniel Defoe in his *Memoirs of a Cavalier,* where European military and political events of the first half of the 17th century are chronicled in the personal narrative of the fictitious "Col. Andrew Newport."

However, this method, to be successful, requires a great literary skill, deep critical understanding, and insight, and above all, the approach must be consistent. Unfortunately this work fulfills none of these requirements. At times it is frankly autobiographical, at others it interjects a series of thumbnail sketches of medical scientists—all of which tends to destroy coherency and relegates it to the category of reminiscences. Further, the work would have been greatly improved by good editing to rid it of repetitions, stylistic imperfections, and the large number of minor errors.

This is not to say that the book will not have appeal. A rich experience and wide knowledge of the medical field provides much of merit which is well presented and will interest both lay readers and members of the author's profession.

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The Grafter's Handbook. R. J. Garner. Faber and Faber, London, ed. 2, 1958. 260 pp. 25s.

The second edition of this handbook retains its commendable objective in presenting the amateur or professional horticulturist with a simple, straightforward discussion of the science of grafting. That it has been brought up to date is evidenced by the inclusion of such topics as gibberellic acid, polyethylene, and mist propagation. The discussion of the recent use of such methods in horticulture and of their immediate application to grafting reflects the progressive attitude of the author. The same may be said of Garner's discussion of the various grafting methods used by virologists in indexing plants for the transmission of virus diseases.

The handbook begins with the occurrence of grafting in nature and antiquity. Succeeding chapters take up compatibility and cambial contact, rootstocks and their propagation, the collection and treatment of scion-wood, tools and accessories, methods of grafting, tree-raising in nurseries, and grafting-established trees, and there is a concluding chapter.

The reader is readily able to follow all instructions by means of 149 line drawings and photographs accompanying the text. A listing of 143 references is invaluable to the professional desiring more detailed information. Many English terms foreign to our horticultural language are defined in the glossary.

The recommended combinations of rootstock and scions cover only pears and plums in the three appendices. This section could be expanded to include other fruits and some of the commonly grafted ornamental woody plants. Information of this type would aid nurserymen in producing compatibly grafted plants of desired habit or vigor.

Garner is to be commended for his clear exposition of the subject-matter of this volume, which documents his 30 years' experience at the East Malling Research Station.

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The Physical Foundation of Biology. An analytical study. Walter M. Elsasser. Pergamon Press, New York and London, 1958. x + 219 pp. Illus. $4.75.

The scientific ideals and, to an important extent, the working structure of biology are governed by established tenets concerning its relations to physics. In this system of faith, physics is the paradigm of what is scientific; and biology at its contemporary best is a rather messy but hopeful kind of physics, the resultant of an inconvenient number of variables and the preoccupation of the better minds with the cleaner aspects of nature. Biologists may feel a bit uneasy about this, especially when they are reflecting upon important biological insights which owe little to physics and which may, as in the case of the evolutionary concepts, have had a considerable impact upon the physical sciences. But, as the cracker-barrel philosophy of biology has developed in the hands of biologists, it has seemed that the alternative would be vitalism, which has been demonstrably sterile.

So pretentious are the titles of books, that many readers encountering Walter Elsasser's *Physical Foundations of Biology* would probably expect to find still another tract on physical pie in the biological sky. This book, by a professor of theoretical physics at the University of California at La Jolla, contains more than the title promises, for it is not merely a highly critical examination of the question "can physics explain biology?" but also a reexamination of the foundations of physics in the light of those potentialities of the physical world that are realized in biological systems.

For, in the frame of Elsasser's analysis, vitalism could be worthy of consideration only if there were some likelihood that biological systems were not subject to the restrictions imposed by basic physical principles, and experiment has rendered this likelihood very small. The real question is not whether biological systems are material systems—they are—but whether they are *mechanisms*. He departs immediately from the seldom-criticized alternatives of vitalism and mechanism.

In fact, the question whether living organisms are mechanisms depends first on the construction of a rigorous and relevant definition of a mechanism; and it is perhaps the relevance, the rarest commodity in discourse about biology, that impresses a biologist most strongly about Elsasser's enterprise. The aspect of mechanisms chosen as most relevant is their performance as converters of information, and his approach is through Information Theory and related areas of physical science. Over a hundred pages devoted to a treatment of problems of feedback and control, information, and storage and memory make rich reading for the biologist, taxing him without bankrupting him. The gist of the argument is that the theory and practice of automata does in fact provide criteria of physical mechanisms in the light of present-day physics, against which biological systems can be tested. If this is not the case, Elsasser's approach loses much of its force. On this point, other readers who are unfamiliar with the field may be troubled by the impression that, while the major part of the argument is abstract and logical, another part seems to hinge on the natural history of electronic systems now in use. One wonders how sure the author can be that the boundaries of physical mechanisms are essentially fixed.

If we know what to expect of a mechanism, we have tests to apply to the various attributes of living organisms. It is clear that biological systems include a great many mechanisms. But the significant test in the author's opinion is given by those expressions of the biological world which may be formulated in terms of the acquisition, storage, and conversion of information. The simplest and most universal of these is the genetic system embodied in the chromosomes. The one that is superficially most similar in operation to the devices familiar to the physicist is the central nervous function of animals. The third—and here Elsasser touches on the sorest spot in mechanistic biology—is development and morphogenesis in those aspects classically covered by the term "epigenesis."

The outcome of his analysis is that living organisms, in these expressions, are not mechanisms as physics can define mechanisms. We need not consider the reasons why he arrives at this conclusion; it is not the function of a book review to give the plot away. But the trouble is not merely the usual "we can't explain this biological phenomenon physically because we don't know enough about it." We seem to know more than enough about the biological systems to prove that they do not conform, and the mechanistic unification can be saved only by discovering something about physical mechanisms that would remove some of their limitations. It is not that the physicist cannot design machines to perform functions analogous to those of organisms, but that the designs are so fundamentally different from those provided by organic evolution.

If we take the position that biological systems are a part of the physical world whose operations, in some very important respects, are not encompassed by the physicists' image of that world, the next step is clear: that image has to be broadened and the direction in which it should be broadened may be indicated by the problems of biology. In Elsasser's view, biology calls for extensions of physics, beyond quantum mechanics, in the same sense that the knowledge of subatomic phenomena called for advances beyond classical physics, without at all affecting the usefulness of the older science in a large domain for which it was designed in the first place. As to the direction in which the advance is likely to take place, his prediction sounds positively musical to a biologist's ear. He stresses the likelihood that the new physics, in one way or another, will be the physics of systems with complex structure. It takes no persuasion to convince a biologist that this indeed is the realm in which the answers to many of his problems lie; such a view has been forced upon him by experience. And if the realm needs to be defined otherwise than by its complexity, we may hazard that it is a domain of objects that are huge by the physicist's standards, with macromolecules at the lower limit. The fact that associations of large molecules are found in nature only to the extent that they are made by living organisms is probably not trivial.

Some of the theoretical implications of structural complexity are dealt with in a chapter on structure and variation. The final chapter deals with the theory of measurement.

If Elsasser is correct, the physical foundations of biology have yet to be established. Insofar as this book is a call to action, much of the action must take place in physics. The author is too modest about his acquaintance with the subject matter of biology to suggest how his ideas might influence the actual course of biological research. The earlier impact of physics upon biology has been fully assimilated. We need no longer be convinced of the merits of quantitation, the consolations of numbers, or the puissance of instrumentation. If the jinni does not appear when the biophysicist rubs his magic lamp, we are generally willing to buy him a bigger lamp. In any case, philosophy does not change the ways of scientists by direct precept, but only by influencing their thoughts about what they are doing. In this case we are assured of the validity of our mechanistic approach to parts of the biological whole. If physics does not sustain us in studies of the whole, we can still resort to the pure art of biological research, which consists of forcing organisms to tell us in their own terms the rules by which they operate.

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Progress in Psittacosis Research and Control. F. R. Beaudette, Ed. Rutgers University Press, New Brunswick, N.J., 1958. xii + 271 pp.

This book is the record of the proceedings of the second symposium on psittacosis, held in New York City in February 1956. Both symposia (the first one was held in 1953) were carried out under the auspices of the New Jersey Agricultural Experiment Station, Rutgers University, and with the financial support of the Hartz Mountain Products Company of New York. The late F. R. Beaudette arranged both symposia. M. Pollard completed the editing of the proceedings of the second symposium.

Psittacosis is a public health and industrial problem which cannot be treated lightly, but which, at the same time, does not deserve the attention accorded a major problem. The purpose of this gathering was to provide suitable recommendations for its control. The symposium ended with the confident conclusion that psittacosis in parakeets and turkeys can now be controlled by adequate chemotherapy and isolation.

Although practical aspects are emphasized, the first three chapters—by Dubos, Huebner, and Shope, respectively—are stimulating lectures on general problems of host-parasite relationship. The most noteworthy contributions are those of K. F. Meyer and his associates on the ecology of avian psittacosis and on the chemotherapeutic control of psittacosis in parakeets. These chapters represent a wealth of experimental work exceedingly well planned and analyzed. Valuable information can be found in many of the other chapters. Steele and Scruggs describe recent epidemics, and Andrews discusses federal developments in psittacosis