Book Reviews

The Hopes, Enthusiasms, Fashions, and Phobias of Science

Thirty-five years ago an important mutation occurred in the bibliographic machinery of science—the first volume of the *Annual Review of Biochemistry* appeared at Stanford. J. Murray Luck was the mutagen. The mutant proved to be splendidly fit, and its progeny subsequently underwent adaptive radiation into numerous other scientific niches: physiology, microbiology, pharmacology, and physical chemistry, for example.

In 1950, the *Annual Review of Physiology* blossomed forth with a new feature. At the instigation of its editor, Victor Hall, it added an introductory chapter of reminiscence by the distinguished physiologist Eugene DuBois. In eliciting this chapter Hall urged that the essayist write something of the "hopes, ambitions, enthusiasms, fashions and phobias" found in the discipline, arguing that "Interest in the philosophic basis of science is increasing as we attempt to approach our ultimate task, the revealing of the nature of man." The free-form introductory chapter became a regular feature of the physiology volume and spread to others.

How has this humanistic note in an otherwise rigid fugue of disciplined review articles been received? Variously, of course; and with a predictable correlation with age. Most of the approval comes from the older readers; the young—always purer in their motivations—more often scorn what they regard as the irrelevancies of philosophical retrospect. The young critics probably fail to realize—and perhaps it is just as well—that the only part of an annual review volume that has the slightest chance of possessing enduring value is the introductory chapter. Who consults a purely factual article in an annual review of 1935? But a chapter of personal reminiscence by an important scientist, if written with understanding and art, may become part of the more enduring literature of human culture. As George Sarton, the great historian of science, said, "Science is progressive and therefore ephemeral; art is nonprogressive and eternal. A deeper contrast could not be imagined." In adding the introductory chapter to their volumes the editors of the annual reviews ran the risk of burying the conceivably "eternal" values of the autobiographies under a mass of the certainly ephemeral literature of the scientific summaries.

To minimize this danger, 35 chapters of reminiscence have now been reprinted in an independent volume called **The Excitement and Fascination of Science** (Annual Reviews, Palo Alto, Calif., 1965. 576 pp. Paper, $1.95; cloth, $5), a collection of autobiographical and philosophical essays by George H. Bishop and others. The authors include W. M. Clark, J. Erlanger, H. O. L. Fischer, R. W. Gerard, J. H. Hildebrand, A. V. Hill, R. Peters, E. Rothlin, and C. J. Wiggers, to mention only some of the more successful efforts. The morals that the authors draw from their lives are as diverse as their personalities. On the one hand Wallace Fenn complains that he was born 50 years too soon and wishes that he could do his work all over again, much more easily, with the splendidly prefabricated apparatus that comes "off the shelf" these days. In contrast, Otto Loewi quotes Robert Louis Stevenson with approval: "To travel hopefully is a better thing than to arrive."

An interesting commentary on the worship of apparatus is found in a story told of Herman Pfund (p. 54): "A student, given the summer job of measuring the temperatures of hot springs, had decided to use a thermocouple. He consulted Pfund on how ice for the reference temperature could be toted all over the wilderness. Pfund told him that he needed only a body that maintains a temperature constant well within a couple of degrees and that a good one could be toted all over the wilderness with an ass."

Each autobiography is preceded by a full-page portrait, only a few of which are fuzzy. Only a single substantial adverse criticism can be made of the volume: it has no index. In the course of telling their stories, the authors recount anecdotes about literally hundreds of other men and women of science. The volume would have been made much more valuable to the historian of science if a complete index of names had been included. The making of this index could have been turned over to a professional indexer: no scientific competence was needed.

Vocational advisers who believe there is a necessary relationship between temperament and success in a chosen line of work should read in succession the accounts written by Otto Warburg and Albert Szent-Györgyi. Their lives surely stand near the absolute extremes of the scientific spectrum. Warburg's character corresponded closely to that of the unfavorable stereotype of those who fear science and scientists. Offered the opportunity to reminisce, Warburg could come up with only one page of personal revelation, and that mostly a mere listing of dates and places. He summarized his approach to scientific problems by saying that "solutions usually have to be forced by carrying out innumerable experiments without much critical hesitation." One has the feeling (perhaps guided by remembered gossip) that the word "forced" is significant. Warburg was a great man, but he was surely one of T. S. Eliot's "hollow men."

What a contrast Szent-Györgyi presents! Where Warburg gives his piece the stark title "Experiments with biochemistry," Szent-Györgyi calls his "Lost in the twentieth century." Only a small part of his essay is concerned with his distinguished and imaginative research. Most of it recounts his incredible life of adventure opposing and fleeing political scoundrels of many hues. Kidnappings, espionage, hairbreadth escapes—it is all as exciting as a James Bond thriller. As for his scientific work, he summarizes his approach thus: "I make the wildest theories, connecting up the test tube reaction with the broadest philosophical ideas, but spend most of my time in the laboratory, playing with living matter, keeping my eyes open, observing

and pursuing the smallest detail." *Playing* . . . not forcing. Many of his more sober-sided colleagues found it hard to live with the gay and witty Hungarian. When he discovered ascorbic acid he proposed to name it "ignose"— *-ose* for sugar, and *ig-* for "I don't know." Arthur Harden primly objected. . . . How about "Godnose" said Szent-Györgyi? . . . He had to settle for "hexuronic acid."

Is it too much to suggest that the Malvolios of science need an occasional Sir Toby to ask: "Doest thou think, because thou art virtuous, there shall be no more cakes and ale?"

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Biochemistry

The symposium on which this volume is based appears to have been an attempt to bring together research workers engaged in clinical research as well as those who study the more basic aspects of muscle chemistry. In many fields of biochemistry, the proceedings of a symposium are out of date by the time they are published. But in the field of muscle research, this is not the case, for progress is not exceptionally rapid in this field. To many workers in this field, muscular contraction is still the interaction of myosin and actin, as it was 25 years ago. Since then, other muscle proteins such as tropomyosin A and B have been discovered. Their importance and relevance to muscular contraction is indicated by the observation that in certain muscle diseases, instead of myosin, tropomyosin-like structures appear. But few attempts have been made to incorporate these muscle proteins into the contraction mechanism. Our knowledge of actin and myosin is still so inadequate that a satisfactory rational model of muscular contraction on the molecular level cannot be constructed. We are far from the stage where only the finer details have to be filled in. We have to realize that although several dozen attempts have been made during the last two decades to determine it, the molecular weight of myosin is still not agreed on.

We learn from this book, **Muscle: Proceedings of a Symposium** (Pergamon, New York, 1965. 600 pp., $15), edited by W. M. Paul, E. E. Daniel, C. M. Kay, and G. Monckton, that there can be little doubt that, in the cross-striated muscle, thick and thin filaments slide by each other during shortening. Apparently these sliding and interdigitating filaments are "guide lines" which secure that, on relaxation, the displaced elements of the muscle fiber will find their way back where they were displaced during shortening.

There is a convincing demonstration that ATP is dephosphorylated in a single twitch and that this can be correlated to the work muscle carried out. This correlation, however, may be nothing more than the balance sheet of a bookkeeper. Many of us who work in this field believe that ATP is split (dephosphorylated) in muscular contraction, but until the details of this enzymatic process are explained on the molecular level, the "splitting" remains a word only and we will not be able to incorporate it into the mechanism of muscular contraction.

The many topics covered in this book should attract a large audience. In addition to papers concerned with the contractile systems, enlightening articles can be found on sacroplasmic reticulum, on the role of Ca^{++} in excitation, and so on. There are 37 papers and as one would expect in a field so broadly covered, the treatment of the problems is not always deep. I wish the symposium had included a session concerned with the application of the fluorescent antibody technique to the localization of muscle proteins.

The papers that deal with muscle diseases are interesting reading that will be useful to clinicians as well as those who work in the laboratory. The value of publishing the comments and discussions that followed the presentation of the papers is apparent, for many of the comments are indeed revealing and add greatly to the usefulness of this book.

Apart from the minor complaints that I have noted, this volume gives a fairly broad view of the activity in this field, and I will end my review with a quotation from the dust cover: "New concepts throughout the whole field of muscle function are contained in this volume which will be invaluable to all, whether advanced students or practicing scientists and clinicians, who are concerned in the study of muscle and its disorders."

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Prehistoric Archeology

In this book, **Introduction to Archaeology** (Basic Books, New York, 1965. 175 pp., $4.50), Shirley Gorenstein introduces the reader, at what I judge to be the level of high school seniors and college freshmen, to the methods and techniques of prehistoric archeology.

Gorenstein begins with a discussion of the kinds of problems that interest archeologists trained and practicing within the context of anthropology. She contrasts this form of archeology with classical studies. This precedes a brief description of the kinds of data that prehistoric archeologists utilize when working with extinct societies.

The major portion of the book is devoted to descriptions of archeological techniques for gathering, recording, and interpreting data. The author devotes a chapter to techniques used to locate sites and a chapter each to methods of excavation and record keeping. The final two chapters describe methods of archeological interpretation. In the first of these final chapters, she details techniques for drawing chronological inferences. The final chapter, "Reconstructing culture," considers the limitations of archeological data and the wide range of cultural inferences that are made possible by the use of special techniques of analysis, a sound background in general anthropology, and imagination.

The author has illustrated the various techniques discussed throughout the book with actual examples from all over the world. Many of the examples are drawn from quite current research.

The book is extremely well written. The prose is clear and concise. The content, too, is excellent. The book is logically developed and presents a readable account of archeological methods of research.

My only major criticism is concerned with the inexpensive format of the publication itself. The paper is of poor quality and the photographs are not at all well reproduced; it is not a handsome book. Of course, increasing the quality of the publication would have made necessary a higher purchase price.

I can recommend this book as an excellent introduction to the techniques of prehistoric archeology for the younger reader.

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