Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

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Hemoglobin. By R. E. DICKERSON and I. GEIS. Pp. 176. Menlo Park, California: Benjamin/Cummings, 1983. Price US $29.95.

The blood-oxygen-carrying protein, hemoglobin, has been studied intensively for over eighty years with thousands of papers published on various aspects of this protein, often with considerable disagreement and contention. One might expect that condensing the current state of this field into a 176 page volume might be a hopeless task. To the contrary. Dickerson and Geis have succeeded in producing a book which describes much of the complex story of the 'structure, function, evolution and pathology of hemoglobin' (as they subtitle it) at a level accessible to the wide variety of investigators and disciplines working on this protein today. Thus, structural biologists examining protein structure, biochemists and enzymologists studying protein function and allostery, molecular biologists probing gene structure and regulation, evolutionary biologists classifying and dating molecules and species, and hematologists pondering the influence of hemoglobin on their patients will all benefit significantly from this review of hemoglobin.

The book begins with a refresher course in the chemical and structural properties of amino acids, peptides, and proteins. This is actually an update of the very successful first chapter of Dickerson & Geis's famous 1968 book *Structure and Function of Proteins*, a second edition of which is long overdue. The second chapter presents a synopsis of the functional properties of the four-subunit hemoglobin contrasted with the single-subunit oxygen-storing protein of muscle - myoglobin. An in-depth description follows of the complex three-dimensional structures of hemoglobin and myoglobin and of the large intersubunit motions and subtle intrasubunit adjustments that accompany the uptake and release of oxygen by hemoglobin. This section is the heart of the book. The complicated exposition of the structural bases for the important allosteric interactions between oxygen molecules and between oxygen binding and pH is transmitted skillfully and successfully to the inquisitive and intelligent reader by the eloquence of Dickerson's pen and the ingenious and painstaking illustrations of Geis's brush. I would have liked to see a more expanded discussion of the experimental tests and mechanism of hemoglobin sections at the end of this chapter.

Hemoglobins have been examined in a wide variety of species by sequence and by three-dimensional structure. Amino acid sequences are available for species ranging from legumes, earthworm, horsefly and primitive fish to man. The authors use this large body of sequence data to demonstrate how myoglobin and hemoglobin evolved and how these data can be used to classify organisms and identify divergence points in the tree of evolution. I found this discussion of hemoglobin sequence and evolution interesting, but overlong and too detailed. On the other hand, insufficient space was devoted to a comparison of the three-dimensional structures over this wide span of species. A discussion of the evolution of the characteristic fold of hemoglobin across the species would have been a relatively unique and illuminating contribution to the reader from these authors.

The last portion of the book deals with the pathology of hemoglobin at the genetic and molecular levels. A large portion of this chapter is devoted to sickle-cell hemoglobin - the most developed example of a point mutation causing a disfunction in humans. The information is described well and controversial areas are handled with grace and skill. A more detailed description of the other various abnormal classes of point-mutant hemoglobins would not have been amiss. The final speculation as to the evolution of a functional tetramer shows that these authors do not lack courage, but the book might have ended on a stronger, firmer note.

This book proves once again that Dickerson and Geis are the Gilbert and Sullivan of modern day structural biology. The flowing, smooth, erudite style of Dickerson is indispensable to the high quality of this work. Dickerson has been on the scene from the first determination of the three-dimensional structure of myoglobin and his lively anecdotal storyline indicates that clearly. Yet, it is the clever, artful drawings of Irving Geis that make the structure really come alive. Puckish and questioning in person, Geis is probably the only individual who has devoted the considerable time necessary to abstract and depict the critical and salient features of a complex molecule like hemoglobin clearly, while the rest of us hide behind our rapidly produced but often confusing computer-drawn figures. No such book can be perfect; but *Hemoglobin* will certainly reward the reader for his investment.

JONATHAN GREER

Physical Biochemistry Laboratory
Abbott Laboratories
Abbott Park, IL 60064
USA

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Introduction à la cristallographie et à la chimie structurale. Par M. VAN MEERSSCHE et J. FENEAU-DUPONT. Pp. 6+849. Louvain-la-Neuve: Editions Peeters, 1984. Prix FB2100 (livre cartonné), FB1680 (livre broché).

Il s'agit de la troisième édition [la première avait été recensée en *Acta Cryst.* (1975). A31, 271] complètement remaniée et amplifiée d'un traité très bien réussi destiné aux étudiants des Facultés Universitaires des Sciences. L'ouvrage est divisé en quatre parties dédiées aux arguments généraux suivants: la symétrie, la cristallographie