terms, lists of authors of taxa and persons for whom taxa have been named, a bibliography, and indices to common and botanical names.

Clearly, no one but Eric Hultén could have written this book, and it is indeed fortunate that he has done so. The flora of Alaska and adjacent regions is viewed from a cosmopolitan and sophisticated point of view and from a wealth of relevant experience. The taxonomy notably avoids the twin pitfalls of provincialism and undue emphasis upon any one or a few criteria. Alaska, as a result, suddenly jumps into the lead as that one of the United States with what is undoubtedly the most attractive and profound treatment of its vascular plants, although its flora is probably the least known. The author is to be congratulated upon a fine achievement, Stanford University Press for its superb execution of its publishing responsibility.

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Festschrift

Structural Chemistry and Molecular Biology. A Volume Dedicated to Linus Pauling. ALEXANDER RICH and NORMAN DAVIDSON, Eds. Freeman, San Francisco, 1968. xii + 907 pp., illus. $10.

This is a remarkable volume of essays, proposed in 1966 when Linus Pauling was 65 years old and written by a number of his students, colleagues, and friends, who dedicate it to him in admiration and appreciation. Thirty years ago, in the preface to the first edition of his book *The Nature of the Chemical Bond,* Pauling wrote:

> For a long time I have been planning to write a book on the structure of molecules and crystals and the nature of the chemical bond. . . . The ideas involved in modern structural chemistry are no more difficult . . . than the familiar concepts of chemistry. Some of them may seem strange at first, but with practice there can be developed an extended chemical intuition which permits the new concepts to be used just as confidently as the older ones of the valence bond, the tetrahedral carbon atom, etc., which form the basis of classical structural chemistry.

The central ideas there, the importance of molecular structure and the nature of the chemical bond, have dominated Pauling's work and because of this work have transformed and defined the emphasis of modern chemistry. As Pauling brought modern structural chemistry to bear on the concerns of biology he defined the idea of molecular biology and provided precise and powerful means of enquiry, a conceptual framework for asking meaningful questions. He devised experimental studies to yield needed quantitative physical-chemical information.

In a short preface the editors, Alexander Rich and Norman Davidson, give a brief outline of Pauling's life and scientific career and suggest the pleasures and stimulation for his students and colleagues of his working style. They underscore the dominant structural emphasis of his approach and the triumphant progress of his work, and give brief but welcome recognition of his nonscientific concerns. There is an account by J. D. Sturdivant of Pauling's scientific work until 1963 and a bibliography of his publications compiled by Gustav Albrecht. The last entry in the book is a reprint of an important 1931 article by Pauling on the nature of the chemical bond.

Contributors were evidently given a broad mandate to write as they chose, and Bernal in his article provides one further direct account of Pauling's work. All the direct accounts sketch the outlines with care, define the elements with precision, and delineate the triumphs with evident pleasure and appreciation. But it remains to the general contributors to reflect the full measure, range, and power of Pauling's achievements. These articles, predominantly reviews, with some original papers and a few more speculative and generalized discussions and reminiscences, do most splendidly round and complete the picture. There are 60 essays grouped in nine sections (entitled The Structure of Proteins; The Chemistry of Proteins; Antibodies; Molecular Biology; Nucleic Acids; Hydrogen Bonding, Water, and Ice; The Chemistry and Structure of Smaller Molecules; Metals and Minerals; and Chemical Theory) which brilliantly reflect the broad areas of Pauling's interest and influence.

Any chemist who misses reading this book has missed much more than the communications at several scientific meetings and at most conferences and symposia. When scientists write as they have written here, staying at home is rewarding pleasure and not deprivation. In "Selected topics in hydrogen bonding" Jerry Donohue discusses with wit and ease some few features of hydrogen bonds: the curious discrepancies between the accepted explanations and the observations they explain, the disappearing bifurcations. It is not simply amusing and elegant; it is fruitful, ordered criticism at its best and most incisive.

The most sophisticated machine and machine inventor are clearly far removed from a good teacher, and light years away from the even rarer teacher who can project the involvement and communication of spoken discourse in the written text. The article by Jürg Waser, "Pauling's electroneutrality principle and the beginner" is immensely satisfying. I enjoyed, too, the article by Hans Kuhn, "On possible ways of assembling simple organized systems of molecules." By avoiding all discussion of experimental techniques it excites an impatient interest in the details of "it has been shown."

Few invented words please; their hybrid origins and dissonance repel. "Emphore," invented in the brief, rewarding article of Arthur B. Pardee, is a useful and appropriate term for "carrier" proteins. It underlines and illuminates, as do all good classifications, the common biological features of their roles.

Linus Pauling has urged us to move imaginatively and to stay firmly in 3D. G. Adam and M. Delbrück explore the rewards of staying resolutely out of 3D in their article, "Reduction of dimensionality in biological diffusion processes." The pleasing reminiscences of Dorothy Crowfoot Hodgkin and Dennis Parker Riley in "Some ancient history of protein x-ray analysis" serve to measure the enormous distances conceptually and experimentally covered since that time in this one area of protein structure by those whose work has been shaped by the Pauling sense of molecular structural identity.

As J. H. Sturdivant in his account, "The scientific work of Linus Pauling," and Edward Hughes in "The past, present, and future of crystal structure determination" both remind us, the decision to initiate a series of x-ray diffraction studies of amino acids and simple peptides was made by Pauling in 1937. The studies were to provide the basic quantitative information not only about intramolecular but also about intermolecular bond lengths, stereochemistry, and packing. The easiest x-ray crystallographic techniques were thus necessarily avoided and the structural problems in consequence were among the most difficult and challenging being studied at that time. These studies are the fundamental source of precise information about protein

stereochemistry and permitted the model studies which led to the α-helix. As Hughes reminds us, Pauling became a leader in the application of x-ray crystal structure to chemical problems, and the method has remained one of his principal experimental tools. From such kinds of precise quantitative information Pauling's brilliant perceptions and intuition derive their compelling strength.

It would have been easy to remark on the rewards of reading most of the other articles in this collection, distinguished as they are by their solid chemistry, scholarship, originality, and imagination. It is in this manner that the students, friends, and colleagues of Linus Pauling have fashioned a portrait of his greatness.

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