save a few systematic botanists is any criterion. In any event, for plant morphologists this is unquestionably the most useful reference work ever compiled.

But anatomy alone will not solve all taxonomic problems in the Angiosperms: the aid afforded by the other morphological fields must also be taken into consideration. When the data of anatomy, of microsporogenesis, and megagametogenesis, plus those of embryonomy and cytology, are all brought together, we may get the answer to the ancient and harrowing question: "What is a species?"

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Structure of Molecules and the Chemical Bond. Y. K. Syrkin and M. E. Dyatkina; translated and revised by M. A. Partridge and D. O. Jordan. New York: Interscience; London: Butterworths Scientific Publs., 1950. 509 pp. $8.75.

The first chapter of this book includes an introduction to wave-mechanical ideas and the hydrogen-atom wave functions, and the second develops the periodic table. The next five chapters develop the theory of the chemical bond, taking up in order the covalent bond, saturation and direction of bonds, resonance of valence structures, resonance of covalent and ionic structures, and the molecular-orbital method. Then comes a chapter on diatomic spectra, dealing chiefly with the subject of potential energy curves. The next few chapters take up particular properties: vibrational frequencies and interatomic distances, dipole moments, bond energies, and intermolecular attraction. The three chapters following deal with certain types of compounds: crystals, complexes, and the boron hydrides. The last three chapters are rather more mathematical, dealing with the calculation of resonance energy in aromatic molecules and giving a number of derivations whose results are quoted earlier.

The book deals with the correlation and interpretation of observed structural data, and with the interpretation of chemical behavior in structural terms. Methods of determining molecular structure are not discussed. The mathematical level, except for the final chapters, is not demanding but is adequate; in fact, we feel it strikes just the right pitch, especially in the first and third chapters, which treat basic wave mechanics and Heitler-London theory, respectively.

This task of presenting the quantum theory of chemical bonding without using much mathematics is one of the most difficult that any teacher faces. There are several good books on the subject. Does this book offer anything new and useful? We think it does. First, the presentations of several basic ideas, though not new or flawless, are well done. Second, the book gives a wealth of experimental data, much more than is usual, to illustrate the topics discussed; enough data are given for the reader to see for himself just how well the rules are obeyed.

The way in which these data are given, however, and this wealth of illustration, give rise to our chief criticism. The data are presented uncritically and without adequate references, and no indication is given of their reliability. Similarly, structural interpretation and speculation on various cases are given uncritically and are, we feel, carried too far; the chapter on the boron hydrides is an example of this. The concepts of modern valence theory are very useful, but their application to chemical problems is an art, and a delicate art at that, rather than a routine logical procedure; one must be able to judge which theoretical conclusions are absolutely sure, and which are speculative. The student should develop this ability to place his bets wisely. We fear that this book will not help him to cultivate this ability as much as it could.

The text seems uneven. We liked the treatment of van der Waals forces but disliked that of the hydrogen bond; we thought the treatment of vibrational frequencies too superficial and empirical, and were surprised to find no discussion of such correlations as Badger's rule; we felt the discussion of metallic structures was far too brief. Some of this unevenness may arise from the revision of the book during translation; but on the whole we feel that the translators are to be commended. Some of the better sections, notably the chapter on molecular orbital theory, are among those that were rewritten.

We can recommend the book as a useful addition to the textbooks on this subject; if the critical viewpoint can be externally supplied, this book should be valuable and stimulating. But we should not advise a student to read it without concurrent discussions with someone learned in the art of which it treats.

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A History of Experimental Psychology. 2nd ed. Edwin G. Boring. New York: Appleton-Century-Crofts, 1950. 777 pp. $6.00.

Boring has revised his history of experimental psychology. Important news for psychology this—the revision of a classic. During the twenty-odd years since the publication of the first edition, nearly every contemporary psychologist has been stimulated by it. In revision, the classic will achieve even greater importance.

The second edition is a true revision. In Professor Boring's own estimate (a fair one), ". . . the new edition is about one-third larger than the old, is one-half new writing and uses for its other half about two-thirds of the old edition." The treatment of the emergence of science (22 pp.) now throws into relief the problem of the great man versus the *Zeitgeist* in the interpretation of history, and Boring returns again and again to this problem. The emergence of psychology within science, particularly within physiology (127 pp.), is treated without much change from the first edition. The discussion of the emergence of psychology within philosophy (116 pp.) includes a new chapter on the Scottish faculty school and the French materialists, as well as a new section on Kant. The founding of experimental psychology by Fechner, Helmholtz, and Wundt (73 pp.) is little changed. The establishment of modern psychology in Germany (106

pp.) includes a new section on Hering and a revised treatment of Külpe; the establishment of modern psychology in Great Britain (44 pp.) is new in considerable part. The establishment of modern American psychology (79 pp.) gives an old chapter on the pioneers and a new chapter on functionalism at Chicago and Columbia, and within educational psychology and mental testing. The old survey of psychology by decades is gone, being replaced by new chapters on Gestalt psychology (33 pp.), behavioristics (44 pp.), brain function (28 pp.), and dynamic psychology (43 pp.). The book ends with a reassessment of psychology (9 pp.) as Boring now sees it.

Like the old, the new edition treats history in terms of personalities. The life, the development of ideas, the impact on students and colleagues, are described for each of psychology's great men and most of its near-great. Here the lecturer can find assembled those tidbits of personal information that bring the dead past alive for the student. Here are not only the ideas of the past, but also an interpretation of how they came into being, with interesting conclusions about the role of the great man in history.

Knowing that this book is a true revision, which, nevertheless still treats history in terms of personalities, psychologists will ask but one question about it. Does it, now, really go beyond the development of structural psychology; beyond sensation, perception, and the classical treatment of the higher mental processes; beyond that somewhat limited group of men who arrogated to themselves the name of experimental psychologists and, by implication, relegated the student of learning, the mental tester, the social psychologist, and others to fields only partially within the realm of science? There is no simple answer to the question.

Twenty years have made a change in Boring. The great events in psychology's history are now Fechner's *Elemente der Psychophysik*, Ebbinghaus' *Ueber das Gedächtnis*, and Freud's *Die Traumdeutung*. The lives and something of the ideas of such moderns as Holt, Tolman, Hull, Skinner, Sears, Lashley, Lewin, and Murray are described. Psychology's greatest names are Darwin and Freud, Helmholtz and James, and Boring is no longer concerned with whether one can properly call these men "experimental psychologists" or even "psychologists." Titchener is now "important in the history of American psychology" rather than "very important," as the first edition held him to be. Dynamic psychology merits a whole chapter to itself, a chapter which leaves the impression that much of the future belongs to this field. On the other hand, an uncritical reader of the index might conclude that Wundt and McDougall are the only names of importance in the history of social psychology. Thomas Brown's secondary principles of association are incompletely listed in a sentence, whereas Wundt's tridimensional theory occupies a page, and Lotze's theory of space perception covers three and one-half pages. Learning theories, as such, are never developed, even though Ebbinghaus' contribution is now seen to be that of opening up the field of learning rather than the field of higher mental processes.

This reviewer is in doubt as to whether he should criticize Boring for his omissions in broadening the term "experimental psychology" or praise him for broadening it as much as he has. The *Zeitgeist* has worked on Boring, but, as a psychologist might except, it has not completely changed the personality of twenty years ago. Since the book will, and should, influence at least one more generation of psychologists, it can only be concluded that the accidents of personality will produce a generation better oriented in the history of experimental psychology narrowly defined than in the history of experimental psychology broadly defined.

Readers of the first edition will not be surprised to hear that the second edition is written for readers who have more than a passing acquaintance with psychological terms and ideas. For such readers the new book will be superbly clear, far more so than the first edition. At times it will purposely amuse. Frequently it will sparkle with stimulating integrations and contrasts. It will not distract with errors of proof or print. It is a classic, revised and much improved.

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* The views expressed in this review are those of the author and do not necessarily represent the official views of the United States Air Force.

Scientific Book Register

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