Biochemistry and Behavior

Like any science book written for and by "cross-disciplinarians," **Biochemistry and Behavior** (Van Nostrand, Princeton, N.J., 1964. 554 pp., $15), by Samuel Eiduson, Edward Geller, Arthur Yuwiler, and Bernice T. Eiduson, reflects the many virtues and the inevitable limitations of both the sciences with which it deals and the scientists who do the dealing. The sciences are biochemistry and psychology; the scientists are biochemists and a psychologist—with a mix of three of the former to one of the latter. But it is a special kind of mix. All four of the scientists are very much concerned with the pathological. Samuel Eiduson (biochemist) is chief research biochemist in the Neuropsychiatric Institute of the Center for Health Sciences at the University of California in Los Angeles; Arthur Yuwiler (biochemist) is chief of neurobiochemistry research at the Veterans Administration Center in Los Angeles; Edward Geller (biochemist) is assistant chief of the same service; and Bernice Eiduson (psychologist) is currently busy in many clinical positions in Los Angeles—in the Reiss-Davis Clinic, the Child Psychiatric Unit of the Kaiser Foundation Hospital, and the Los Angeles Society for Psychoanalytic Medicine. Their book clearly reflects these professional concerns.

If the objective of the authors had been to summarize the voluminous literature of attempts to relate biochemistry to mental aberrations, our review would be less captious than we are afraid it may be. We would have pointed out that such an objective is, indeed, achieved in this book. The volume is organized into six fairly clear and useful categories of chemical research: energy and respiration, neurohumours, hormonal regulation, toxicity and metabolic abnormalities in schizophrenia, psychoactive chemical agents, and biochemical genetics. Each problem area has a brief and most competently done introduction to the known biochemistry for that area, and then a historically oriented (for which, bravo!) summary of studies, researches, and experiments relating biochemistry to mental aberrations. The summary, moreover, is not merely a card-index summary. It is critical; it is interlarded with sophisticated admonitions about experimental logic (and this field of research is badly in need of such admonitions—see, for example, the discussion, on pages 251 to 255, concerning the traps to be avoided by the experimenter who seeks for biochemical abnormalities among the mentally ill); and each summary ends on a deservedly modest and cautious note when it seeks to assess the contributions that biochemical research has thus far made to our understanding or treatment of dementia or amentia.

While the literature covered is voluminous, the bibliography gives some evidence that the chapters were completed at different points over a fairly long time-range (as science flies these days). Some chapters have very few references more recent than 1959; some have an occasional 1963 reference. But in general, for a book published in 1964, the number of references to work published in 1961, 1962, and 1963 seems quite inadequate. All this is what we would have said, and we would have ended our review with the judgment that we have here a well-written, carefully edited (someone should get a thankful nod for the lack of typographical errors), and a very useful volume for the biochemist or clinical psychologist who is actually working in the field of biochemistry and mental aberrations; an invaluable guide and counsellor for those who are thinking of embarking on such work; and an authoritative summary for anyone who merely wants to know the state of the art as of the early 1960's.

But had we ended our review on that note we suspect the authors would have been unhappy, for it is clear from Gardner Murphy's foreword to the book and from the authors' own preface, introduction, and concluding chapter, "Biochemistry and behavior," that this book had a more ambitious objective than that indicated by our summary judgment. The authors sought to examine the relations that have already been discovered between all biochemical events and all behavioral events—not merely the pathological manifestations of the mind—and to suggest concepts and hypotheses that might encompass such relationships. And it is here that we find our greatest disappointment with the book, and it is at this point that we felt the need for a slightly different mix than that provided by these brave and capable cross-disciplinarians. Perhaps one more psychologist—an experimentalist concerned with "normal" perceptions, learning, problem solving, motivations, and the like—would have made enough of a difference so that this excellent volume would be as useful to the "normal" psychologist as it is to the "abnormal" one. Indeed, we might argue that a more basic and less pathologically oriented volume would be a more useful book even to the "abnormal" psychologist. Reading the volume as it now stands leaves one with something close to blooming, buzzing confusion. One is impressed by the varied, numerous, and often conflicting claims of cause and effect (or no effect) that have resulted from this research. We cannot help but believe (given *our* biases) that until we know something about the kinds of changes (chemical and structural) that normally, regularly, and usually occur in the nervous system as a consequence of "normal" experience and "normal" learning, little more than shotgun progress will be made relating biochemistry to behavior, even pathological behavior. Now, to be sure, the present volume does make some references to this sort of basic work, and it is also true that the number of additional experimental studies that might have been discussed is not overwhelming in number nor decisive in content, but this is not the whole story. As we suggested at the beginning of this review, the professional concerns of the authors seem to predispose them to an orientation other than the one we urge here. How else can one account for the fact that a book titled *Biochemistry and Behavior* and published in 1964 does not have a single reference to such workers as Hyden, McConnell, and McGaugh? And, at the risk of being ostentatiously honest, we must admit

that we were somewhat "put out" by finding no reference more recent than 1958 to our own work on neurochemistry and behavior. Indeed the authors seem to have been determined to avoid any discussion of data, and any speculation (their own or that of others), bearing on the fundamental questions of neurochemistry and behavior. That is why the book sometimes takes on the flavor of a medical "annual review" and fails to provide, as it might have, what is so much needed, and what, indeed, the authors lead us to believe we will find—a good, hard look by competent scientists across their disciplines. A good, hard look would almost have to be somewhat speculative. It would have to ask such questions as "*Why* do that?"; "*Why* do we want to know that?"; "*Where* shall we look?" The field of biochemistry-and-behavior is so new that the *first* answers to such questions will almost necessarily be speculative. Any book written now can only provide first answers.

There is, perhaps, another reason why we wish an experimental psychologist had been added to the mix. We have already referred to the book's admonitions to would-be experimenters —admonitions definitely called for and admonitions well worth heeding. But most such critical comments in the book are addressed to the psychologist. This, in our experience, seems a bit one-sided. The problem of doing good interdisciplinary work in chemistry and behavior is not altogether that of taming the psychologist. The biochemist, too, finds his techniques wanting and his methods a bit fuzzy when he addresses himself to problems of the relations between biochemical events and behavior. He frequently discovers that the psychologist needs quantitative biochemical data rather than information that such and such a compound is present or absent—and the biochemist does not immediately have the techniques needed to supply such data. He frequently finds that the psychologist is seriously and insistently concerned with individual differences and that he demands of the biochemist precise measurements of individual (not "pooled") brains or livers. The biochemist finds that his techniques must be refined and refined to meet these new demands. And further, because of the ubiquity of individual differences, the psychologist refuses to rest content with the data from one animal, or two animals, or even three animals—he wants data from many animals, many times repeated. The biochemist finds that his ordinary techniques are too time consuming, too laborious, and too expensive, and he must seek to develop new techniques. Unfortunately, there is no hint of these problems in *Biochemistry and Behavior.* There is very little suggestion that in this cross-disciplinary enterprise both disciplines must solve new internal problems.

We have been unfair. It is unfair to castigate the authors for having written their own book rather than the kind of book we would like to see written. But, to repeat what we have said above —this book has so many virtues, and will (and should) be read by so many, that we only wish it had yet a few more virtues.

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Analytical Chemistry

Principles and Methods of Chemical Analysis. Harold F. Walton. Prentice-Hall, Englewood Cliffs, N.J., ed. 2, 1964. xviii + 484 pp. Illus. $10.95.

This work represents an extensive revision and a moderate enlargement (from 435 pp.) of the well-known first edition published in 1952. To quote from the preface, "This book is about the 'chemistry' in analytical chemistry. It is devoted to the thesis that chemical reactions and chemical separations will continue to be important to the analyst for many years to come."

Changes from the first edition include new chapters on precipitation from homogeneous solution, solvent extraction, acid-base titrations in nonaqueous solvents, and "linear" titration methods. The sections on complexometric titrations and ion-exchange separations have been rewritten. The chapter on electrolytic methods of analysis has been dropped, but some of its contents have been incorporated into the new chapter on linear titration methods.

The selection of topics in a book such as this is inevitably arbitrary to some extent. A topic as important as analysis based on reaction kinetics is not included, although catalyzed reactions and induced reactions are briefly discussed. Separations, which constitute such an important part of analysis, may be based upon chemical or physical behavior, or upon a subtle combination of both. The author has chosen to include liquid-liquid extraction, including multiple and countercurrent extraction, but to exclude column chromatography, both liquid-liquid and liquid-gas. Ion-exchange columns, however, are treated. Again, the chapter entitled "Separations by vaporization" includes examples involving chemical change (SiF_4 evolution, methyl borate distillation, microcombustion, and the like), and even the Schöniger oxygen flask method, which hardly involves separations at all. Electrolytic separations are barely touched upon.

The strongest features of this book are the descriptions of organic reagents as precipitants, extractants, and chelating reagents. Both the time-honored reagents and new ones are described in admirable fashion.

The weakest features are the treatments of electrode phenomena, particularly irreversible phenomena and electrolysis. The very useful concept of formal potentials is not introduced until the very end of the chapter entitled "Oxidation-reduction potentials" so that its utility—for example, in discussing titration curves—is not brought out. Electrode polarization is defined as "any impediment to the flow of a steady current over and above the ohmic resistance" (p. 428). At best, such a definition will cause confusion between polarization (measured in volts), polarization resistance, and film resistance (measured in ohms).

There is an occasional tendency to oversimplify which leads to confusion or error. Writing cerium (IV) as Ce^{++++}, for example, is apt to lead the student to serious misinterpretation if he attempts to reason from principles.

In summary, this book is a welcome revision and updating of a pioneering work in an often neglected field. With its smooth easy-to-read style, it should serve well as a textbook for or supplement to beginners' courses in quantitative chemistry, and as an introduction to more advanced treatments of these subjects.

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