

book reviews

CHEM STUDY and CBA.

This reviewer plans to make this available to his students in the professional level P.S.I. chemistry course, with the tapes available to them through the library; \$18/cassette for 11 cassettes is rather heavy for each student to bear.

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The Student Chemist Explores Computations

Julian S. May. Richards Rosen Press, New York, 1974. 87 pp. Figures and tables. 14.5 cm x 22 cm. \$4.80.

This short book on chemical calculations is intended to give high school students an understanding of how to manipulate numbers involving certain relationships and laws in science. Having taught in New York City high schools for close to twenty-five years, the author is aware of the problems that beginning students encounter with calculations involving percentage composi-

tions, stoichiometry, concentrations of solutions, gas laws, and the like. Very carefully he moves from rather simple problems to more complex ones, all the while showing the student that these calculations need not be as difficult as they might first appear. Wherever appropriate he has used analogies "to help make problem-solving not only more relevant but also more meaningful." Unfortunately, one of these may be a bit confusing to the beginner, for on p. 12 in an analogy intended to help clarify the idea of how to determine the empirical and molecular formula of a compound, the word "number" is used instead of "weight."

Each short chapter has a few carefully worked-out problems and several for the student to try (with answers) so that altogether there are about fifty-seven worked-out problems and sixty-five left for the student. (The answer to no. 4 on p. 62 is wrong with an erroneous exponent.) The details given with these solved problems are good, but there perhaps might have been more of them and certainly more problems for the student to practice on.

The high school teacher who is looking for a book that deals with algebra, exponents, and logarithms as well as with chemical calculations will not find that in this volume. However the teacher who is interested in a brief supplement to a standard text which gives a lucid presentation of problem solving with a few selected topics will do well to consider this book.

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Quantum Chemistry

Ira N. Levine, Brooklyn College of the CUNY, New York. 2nd Edition. Allyn & Bacon, Inc., Boston, Massachusetts, 1974. xii + 506 pp. Figures and tables. 16 x 24 cm.

This book is an excellent text for a first-year graduate course in quantum chemistry which lasts for two or three quarters and which stresses the electronic structures of atoms and molecules. It does not deal with the absorption, emission and scattering of light nor does it treat the dynamics of motion on potential energy surfaces. A derivation of the Hartree-Fock SCF equations based upon minimizing the energy of a Slater determinant wave function should have been included in Chapter 11. I feel that the brief discussion of modern developments in quantum chemistry given in Section 15.13 is inadequate for a graduate level text. Such modern topics as Sinanoglu's and Nesbet's treatments of electron correlation, many-body Green's functions, diagrammatic techniques, and calculations of properties other than energy are not handled in sufficient detail to give the student a feel for their content and importance. The inclusion of nice sections on semiempirical methods, the Woodward-Hoffmann rules, and concrete examples of SCF calculations are highlights of the book. The main strength of this text seems to be a lucid discussion of the fundamentals of quantum chemistry including operators and wave functions, one-dimensional model problems, angular momentum, variation and perturbation methods and electronic states of atoms and molecules.

In my opinion, Professor Levine has done a very good job of writing a text which is at an appropriate level for first year graduate students and bright undergraduate students at most PhD granting universities. He has succeeded in treating difficult concepts and derivations in a refreshingly pedagogical manner without going so far as to avoid complicated subjects or leave the more tedious steps to the student. I especially like his waiting until Chapter 7 to state the basic theorems of quantum mechanics; by this time he has already (in Chapters 1-6) overcome the students' fear of or unfamiliarity with such new concepts as operators, measurements, wave functions, eigenvalues, average values, etc. I know from experience that to introduce the basic theorems before the student has seen the treatment of a few simple problems leads to much confusion and apprehension. I believe that Professor Levine's order of presentation is very appropriate for a book which is supposed to be read by students as the primary text in a course in quantum chemistry. He has written this book in a style which shows a strong concern for the student; he clearly wants to make the subject as understandable and enjoyable as possible. I feel that he has done an admirable job in this respect.

In summary, I feel that I can recommend this book highly for a beginning graduate course in quantum chemistry. In my opinion, the omission of detailed treatments of some important modern developments limits the value of this text as a research refer-

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book reviews

ence book for the student who is interested in pursuing a career in theoretical chemistry or experimental chemical physics. However, the exceptionally clear and pedagogical style in which the material is presented makes this a book that students will appreciate.

Jack Simons

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Synthesis of Life, Benchmark Papers in Organic Chemistry

Edited by Charles C. Price, University of Pennsylvania. Dowden, Hutchinson & Ross, Inc. Stroudsburg, Pennsylvania, 1974. xiii + 391 pp. 18 × 26 cm. \$22.00.

This book is the first in the series "Benchmark Papers in Organic Chemistry" edited by C. A. Vanderwerf. I welcomed this review since it allowed me the rare opportunity to combine my interests in chemistry and zoology and remedy what one colleague has termed my "professional schizophrenia!" It also gave me the opportunity to catch up on the developments of the last ten years in molecular genetics. For, despite its title, the book deals not only with the origins of life, but also with the present mechanics of life with respect to transcription at the molecular level.

The book is divided into seven sections dealing with the topics (1) the natural [prebiotic] synthesis of biomonomers, (2) the synthesis of living systems, (3) the synthesis of proteins, (4) replication of RNA and DNA, (5) problems associated with the origin of structure in primitive systems, (6) the structure of ribosomes, and (7) an overview of life and the potential of living systems. Many of the articles will not be of interest to organic chemists; biochemists and molecular biologists will find it more to their liking. However, the volume can well be read by all chemists interested in understanding the bridge between biology and chemistry. The authors form an all-star class with articles by Anfinsen, Calvin, Fox, Khorana, Kornberg, Miller, Ponnampuruma, Spiegelman, and Wald. I found the choice of articles excellent.

I have given the indexes in "Benchmark Papers" mixed reviews (THIS JOURNAL, 52, A485, A562 (1975)), and I find the practice followed in the present author index regrettable. Instead of directing the reader to the reference where it appears in the text (multiply, if necessary) the index lists the page number of the Literature Cited section at the end of each article. If the former method had been used, a reader interested in knowing if the work and views of Smith are contained in the present volume can find them readily in the text and if he wishes to consult the originals, the text references lead directly to the Literature Cited. In the present volume the reader can readily find Smith in the Literature Cited. He now has the chancey job of finding reference 97 in a long (up to 59 pages) article. If the author has further complicated life by alphabetiz-

ing his references, the reader is looking for the proverbial needle. Furthermore, on page 24 some work of Cyril Ponnampuruma is mentioned, but the reader could never find it from the index no matter how diligently he tried because it is simply not there.

I was pleasantly surprised to find the universal acceptance of natural selection ("Darwinian evolution") operating on the earliest forms of life and its precursors, as well as on relatively small differences in later forms. Under one name or another, the "neutralists" have been combatting Darwin for over one hundred years, constantly diminishing the difference between two forms and challenging the "selectionist" to respond. Obviously, as the difference between the traits approaches zero, the difficulty in showing selection approaches infinity. Since the advent of molecular biology, the "neutralist" school has been able to focus on differences as small as a single amino acid in a polypeptide sequence (cf. Kimura, *Nature*, 217, 624 (1968) and King and Jukes, *Science*, 164, 788 (1969) and, for the selectionist response, Uzzell and Corbin, *Science*, 172, 1089 (1971), Crowson, *J. Mol. Evol.*, 2, 28 (1972), and Van Valen, *ibid.*, 3, 89 (1974)). There is a strong selectionist thread throughout this entire volume. Wald, in concluding his discussion of optical activity, states the selectionist principle succinctly: "We are the products of editing, rather than of authorship."

One unfortunate error was encountered with annoying frequency. If a biologist spoke of titrating muriatic acid with sodium hydrate, his usage would (correctly) be scoffed at by chemists. Yet some of these same chemists think nothing of using such abominations as *homo sapiens* (pp. 285, 286) or *E. Coli* (p. 288). The erring biologist can at least claim he is only a hundred years or so out of date; the above examples of "scientific" names have never been correct. All scientific names must be set off by a different type-face (usually italics) from surrounding material. Generic names are always capitalized. Specific epithets should be lower case (some older botanists capitalized patronyms but this practice is discouraged). To claim that these may be errors of editorship rather than authorship only compounds the problem. Journal editors should be at least as literate as authors!

I have discussed the pros and cons of reprint volumes of the "Benchmark" series in previous reviews, and I have followed with interest both the favorable and unfavorable reviews of "Benchmarks" in other journals. The volumes previously reviewed consisted mainly of original research papers on various subjects. In contrast, the present book comprises, in addition to original literature, review articles and general, semi-specialist discussions as illustrated by some of the sources: *Bulletin of the Atomic Scientists*, *Chemical and Engineering News*, *Chemical Reviews*, *Endeavour*, *Science*, and *Scientific American*. One source is another book! As a result, the intended audience appears to be somewhat different from that of the previously reviewed volumes. I doubt very much that either Sol Spiegelman or Arthur Kornberg ran right

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