gies for ESR studies in clinically important areas to which it may apply (cancer, aging, enzymatic oxidation–reduction systems in specific tissues); the relation of free radicals to unsolved problems of energy transport in biological systems.

The book under review is entitled "Free Radicals in Biological Systems" and contains 29 papers presented at a symposium of that title held at Stanford University in March, 1960. There were 59 participants in the symposium: 7 from abroad, 24 from California and the remainder from elsewhere in the U. S. According to its planner the symposium was designed to "review the progress that had been recently made and to assess the future." It is appropriate therefore that the volume be evaluated against the foregoing summary of the present accomplishments and problems in the field.

Over one-third of the papers deal with the effects of ionizing radiation on solid-state systems of biological interest. They vary considerably in length, experimental detail and depth of analysis. At one extreme is a highly informative treatment of ESR signals in oriented single irradiated crystals of glycine; at the other is a wholly empirical comparison of ESR signals from irradiated "mechanical" and "molecular" mixtures of 16 different amino acids with those due to irradiated cow tail hairs.

About one-fourth of the papers are on free radical components of oxidation–reduction enzyme systems. These, too, vary considerably in content. One paper is chiefly a report of failure to detect an ESR signal in a particular enzyme system and repetition (at a lower level of resolution) of other ESR observations previously reported by other investigators. Another paper derives, from purely optical data, a scheme involving a free radical intermediate, without reporting whether the critical ESR experiments have been done. Since a note to this paper, added in proof, withdraws the scheme, the critical experiment has apparently been carried out, but with negative results. In contrast, a detailed paper (35 pages) on certain flavoprotein enzymes discusses correlated optical and ESR data. This paper is also distinguished in that it represents the only effort reported in the symposium to describe quantitative changes in free radical concentration associated with enzyme activity. Despite the obvious importance of quantitative data in enzyme studies, they are difficult to achieve, and require, for example, careful control over the dielectric properties of the instrument cavity and over comparisons between samples and standard concentrations of free radicals. Unfortunately the quantitative data presented in this paper do not greatly advance our knowledge of this problem. The quantitative data are contained in two figures. In one of these, the ordinate which relates to ESR-determined free radical concentration, is marked "% semiquinone" but neither the legend nor the paper's text describes what experimental procedures and calculations were involved in the derivation of this term. The second figure is intended as a quantitative comparison of ESR and optical data from a butyryl dehydrogenase system as a function of time. Its value is rather limited by the lack of an ordinate which relates to ESR data.

The volume contains a single 4-page paper on ESR studies of photosynthetic systems. This paper contains some interesting conclusions regarding the quantum yield of photo-induced spins but, being so limited in scope, hardly reflects what is now known about ESR observations of photosynthetic systems. The only other papers on light-induced free radicals are two brief reports of essentially trivial observations of ESR signals in plant pigments.

Problems relating to ESR instrumentation are considered in three papers. One includes a useful discussion of principles involved in maximizing the applicability of ESR spectrometers for biological work. Another paper describes the construction of a flow apparatus for ESR spectrometers (elsewhere in the volume, results of the application of a similar apparatus to enzyme studies are given). The third paper describes a double cavity designed "for precision measurements of radical concentration" in ESR spectrometers. The usefulness of the paper to a reader interested in accomplishing this end is somewhat limited by the fact that no quantitative data are given, results being embodied in statements such as "Two samples of DPPH were compared and found very nearly equal in signal amplitude."

A comparison of the contents of this volume with the foregoing summary of the status of the problems suggests that the symposium does not accurately reflect the experimental results, or the unsolved problems of current studies on free radicals in biological systems. Certain editorial inadequacies add to the difficulty which the reader will encounter in using this volume as a guide to the field. The chief of these is that in a number of instances observations which repeat, confirm or contradict earlier work previously published by others are put forward without any mention of the earlier observations.

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Chemobiodynamics and Drug Design. By F. W. SCHUBLER, Ph.D., Professor and Chairman, Department of Pharmacology, Tulane University, School of Medicine, New Orleans, Louisiana, McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N.Y. 1960. xiv + 638 pp. 16 × 23.5 cm. Price, $19.50.

This pretentious book attempts to cover all the scientific and practical considerations which now (and in the future ideally could) enter into decisions as to what chemical compounds should be synthesized in order to achieve substances of desired physiological activity.

Although written with great enthusiasm and imagination the text is stuffed with quasi-philosophical absurdities typified by "Scientific investigation is a form of *living growth* in the truest sense of the words and everything which stifles [*sic*] the pulse of life becomes dead—QED!" (p. 587), and is marred by numerous gross misconceptions, careless errors and haphazard documentation.

All things considered it is the belief of the reviewer that this book could seriously misguide a normally unsophisticated student and would prove an unbearable burden to any normally sophisticated teacher who attempted to use it as a text or reference work.

ORGANIC CHEMICAL RESEARCH SECTION
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Treatise on Analytical Chemistry. Part II. Analytical Chemistry of the Elements. Volume I. Edited by I. M. KOLTHOFF, School of Chemistry, University of Minnesota, and PHILIP J. ELVING, Department of Chemistry, University of Michigan, with the assistance of ERNEST B. SANDELL, School of Chemistry, University of Minnesota. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1961. xxi + 471 pp. 16.5 × 24 cm. Price, $16.00; subscription price, $14.00.

The volume under review is the first of a series of volumes of Part II of this Treatise. It is devoted to the analytical chemistry of hydrogen; water; the gases of Group 0 of the periodic system, and to the alkali metals. Six different authors have contributed to the volume, but the style has been made as uniform as possible by editorial policy.

In addition to analytical methods, there is a thorough introduction (32 pp.) to inorganic nomenclature by W. C. Fernelius, and a chapter (9 pp.) on the general concepts of the underlying philosophy of analytical chemistry by James I. Hoffmann. The various chapters on the elements contain much information on chemical and physical properties, like that normally included in books on general chemistry.

The chapter on hydrogen (23 pp.) by H. F. Beeghley also summarizes information on deuterium and tritium as well, but it is chiefly concerned with the estimation of hydrogen in metals and alloys, either by combustion, vacuum fusion, or by heating *in vacuo*. The determination of hydrogen in organic substances is covered elsewhere in the treatise.

The chapter on water (137 pp.) by J. Mitchell, Jr., follows the general lines of the book on "Aquametry" of which he is co-author. The method of Karl Fischer properly receives main emphasis among the chemical methods for water. There is, however, a thorough review of other chemical methods as well as a brief outline of physical techniques. The uses of infrared measurements, nuclear magnetic resonance spectroscopy, mass spectrometry, neutron scattering and radiometric methods are reviewed, together with numerous conventional applications of physical meas-