D_2O were incubated at room temperature for 60 minutes. The reaction was stopped by addition of sulfuric acid and the L-malic acid was extracted with ether. Analysis showed that 13.3 μM. of malate had been formed. After suitable dilution, a sample of the malate was converted to the diphenacyl derivative. The procedure was similar to that previously described for the preparation of phenacyl lactate.[4]

Separate experiments with OAA and DPNH in D_2O confirmed the fact that malic dehydrogenase catalyzes a direct transfer of hydrogen between coenzyme and the keto form of OAA. These results are consistent with previous studies of other pyridine nucleotide dehydrogenases.[5] In addition, experiments with enzymatically reduced DPND (reduced monodeuterio DPN) showed that malic dehydrogenase uses the same side of the nicotinamide ring as do alcohol dehydrogenase and lactic dehydrogenase.[4,5,6] These experiments will be described in detail elsewhere.

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(5) B. Vennesland, F. H. Westheimer, "The Mechanism of Enzyme Action," W. D. McElroy, Johns Hopkins Press, Baltimore, Md., 1954, p. 307.

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DEPARTMENT OF BIOCHEMISTRY
UNIVERSITY OF CHICAGO
CHICAGO, ILL.

BIRGIT VENNESLAND
T. T. TCHEN
FRANK A LOEWUS

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BOOK REVIEWS

Chemistry of the Lanthanons. By R. C. VICKERY, D.Sc., Ph.D. Academic Press, Inc., 125 East 23rd Street, New York 10, N. Y. 1953. viii + 296 pp. 15 × 22 cm. Price, $6.00.

Dr. Vickery defines the lanthanons as "that series of elements whose atomic numbers range from 57 to 71 inclusive and whose properties endow them with a location in the sixth period of Group IIIA of the Periodic System." Most chemists probably still refer to these elements as the "rare earths," but this archaic and misleading designation suggests no logical terminology for the analogous series which includes the heavy synthetic elements.

In 1947, J. K. Marsh proposed that the two series be designated "lanthanons" and "actinons," respectively, but American chemists, whose etymological sense perhaps does not match that of their English colleagues, have rather generally adopted the rival terms "lanthanides" and "actinides." At the risk of being accused of chauvinism, the reviewer will hereafter use "lanthanides" in place of "lanthanons."

The increasing availability of these elements in pure form at reasonable cost, and a growing appreciation of their unique value in fundamental investigations into the physics and chemistry of both solids and solutions, suggest that they will continue to be of interest to physical and inorganic chemists for some years to come.

"The Chemistry of the Lanthanons" may be expected, therefore, to attract the attention of a much wider audience than the small band of veteran "rare earth chemists." In attempting to assess the merits of Dr. Vickery's book it is essential to recognize that it was written at a time when ion exchange techniques were effecting revolutionary advances in methods of separating and purifying the lanthanides, but before these methods were widely adopted. (Literature abstraction for the book is said to be complete through December, 1951, but references to some important papers of earlier date are missing.) As a result, the sections on separation and purification, which comprise about half of the text, describe many methods which ion exchange techniques have now rendered obsolete. The few pages devoted to exchange methods are inadequate to represent their present importance. This deficiency is compensated in part by the very thorough discussion of methods of separation based on oxidation or reduction processes.

The remaining chapters are as follows: 1, Historical; 2, Modes of Occurrence; 3, Structure, Spectroscopy and Paramagnetism; 4, Isotopic Composition, Radioactivity, and Valency; 13, Properties of the Lighter Lanthanons; 14, Properties of the Heavy Lanthanons; 15, Analytical Methods; 16, Uses and Applications of the Lanthanons. The chemistry of yttrium is summarized in a four-page appendix.

The first two chapters are excellent. A fascinating, if brief, account of the work of the pioneers in "rare earth" chemistry is followed by a thorough and satisfying discussion of the distribution, geochemistry and mineralogy of the lanthanides.

In the next chapter, however, Dr. Vickery evidently is on unfamiliar ground for his discussion of electronic structure, spectroscopy and paramagnetism is marred by errors of fact as well as by occasional sentences which seem to defy comprehension. As an example of a factual error, in discussing the absorption spectrum of cerous ion he has confused the spectroscopist's notation CeIV with the chemist's Ce^{4+} ion, while the inquiry "Is it possible that the subsidiary bands to the violet side of the strong sharp bands are but umbra and penumbra effects due to scattering by alien ions and/or reflections from the walls of defects produced in the atom structure by the gradual variation in the contents of the 4f and 5d shells?" still loses the reviewer at about mid-sentence.

Similar criticisms apply elsewhere in this chapter, which can hardly be regarded as a sound introduction to the subject matter covered.

Isotopic composition and radioactivity are considered in the fourth chapter, along with the unrelated subject of valency. The former are dealt with chiefly by a table of isotopes giving abundances, half-lives and modes of decay. The discussion of valency makes little use of thermodynamic reasoning, the non-tripositive states being ascribed qualitatively to the "tendency" of the ions to achieve the stable La^{+3}, Gd^{+3} or Lu^{+3} structures.

The two chapters (13 and 14) which summarize the properties of the metals and compounds are thorough and reasonably critical. In discussing the sesquioxides, however, Vickery repeats the error found in Wells' "Structural and Inorganic Chemistry" in inverting the temperature stability of the hexagonal and cubic forms, and there is no crystallographic justification for writing a compound such as LaOCl as $La_2O_3 \cdot LaCl_3$.

Analytical methods are covered quite completely in chapter 15. Primary emphasis is on spectral methods. Irradiation activation analysis is mentioned briefly.

In the final chapter a number of uses and applications of the lanthanides are mentioned. Some of these, such as the use of cerium oxalate to relieve sea-sickness, probably will come as a surprise to most readers.

The appendix on yttrium summarizes adequately the meager information now available on this element.

In conclusion, although Dr. Vickery's book does not form a "complete text to the chemistry of the lanthanons," as claimed on the jacket, and although its deficiencies have been emphasized in this review, it constitutes a valuable and significant addition to the literature of lanthanide chemistry. Those interested in this field will find that "The Chemistry of the Lanthanons" is well worth its modest purchase price.

The book is nicely bound, and the type and printing seem to the reviewer to be unusually attractive.

University of California
Radiation Laboratory
Berkeley 4, California
B. B. Cunningham

The Equilibrium Properties of Solutions of Non-Electrolytes. By the Faraday Society. The Abderdeen University Press, Ltd., 6 Upper Kirkgate, Aberdeen, Scotland. 1953. 292 pages. 15.5 × 25 cm. Price, 35s. net.

The papers included in this volume were presented at the Fiftieth Anniversary Celebration of the Faraday Society, and have been published in the May, 1953, issue of the "Transactions of the Faraday Society." The volume falls naturally into two parts, "General Theory," and "Experimental Work," each part starting with an introductory paper outlining the general field to be covered. Dr. Joel H. Hildebrand, delivering the Seventh Spiers Memorial Lecture, gave the keynote address entitled "Models and Molecules." Reviewing the question of the nature of liquids and solutions, he dismisses the "fashion" to regard liquids as imperfect solids, advocated by Frenkel in favor of the older notion which looks upon "fluids," namely gases and liquids as the same thing. Being essentially free of mathematical theory, the paper will appeal to the average reader, familiar with the more classical literature of chemistry.

Part I is introduced by a paper by E. A. Guggenheim on "General Theory." It is highly theoretical and is intended for the specialist. Titles of papers are "The Statistical Mechanical Theory of Molecular Distribution Functions in Liquids, The Statistical Mechanics of Systems with Non-central Force Fields, Theoretical Models and Real Solutions, Lattice Theories of Liquids and Solutions at Low Temperatures, The Vapor Pressures of Athermal Mixtures, Athermal Mixtures, Solutions of Chain Molecules, Statistical Thermodynamics of Solutions of Molecules with Spherical Fields of Force, and Statistical Thermodynamics of *r*-mers and *r*-mer Solutions." Eighteen pages are devoted to a "General Discussion" which followed the above papers.

Part II on "Experimental Work" is introduced with an article by D. H. Everett in which the author takes up the attitude of the experimentalist, the development of experimental technique and the analysis and presentation of results. Five of the articles deal with the thermodynamic properties of various binary solutions. Others deal with "Chemical Statics of Methyl Halides in Water, the Theory of Upper and Lower Critical Solution Temperatures, the Negative Saturation Curve, Equilibria Between Solid, Liquid and Gaseous Phases at Low Temperatures, the Generalization of Brönsted's Principle of Congruent Mixtures and The Interfacial Tension and Other Properties of the Cyclohexane + Aniline System Near the Critical Solution Temperature."

The last five papers dealing with "Ultrasonic Absorption in Binary Liquid Systems Near the Critical Solution Temperature, Association in Polar Vapors and Binary Vapor Mixtures, Solubility in Compressed Gases, The Solubility of Solids in Gases, and the Theoretical Aspects of the Effect of Pressure on Gas + Condensed Phase Equilibria" were of special interest to the reviewer, because they took up problems still lying in a so-called "no man's land" of science. Phenomena such as the actual separation of a single gaseous phase into two gaseous phases of different compositions, the increase of the solubility of a solid above its normal vapor pressure when surrounded by a compressed gas, and the anomalously high acoustic attenuation of binary solutions near the upper and lower critical solution temperatures are developed in some detail. The section is concluded by a "General Discussion" covering forty pages.

For anyone interested in either the theoretical or experimental aspects of solutions, the book holds a wealth of modern, clearly presented and carefully edited material, written by the foremost experts in the field today.

Department of Chemistry
University of Colorado
Boulder, Colorado
Frank E. E. Germann

Traité de chimie organique. By V. Grignard, G. Dupont, R. Locquin (joint editors) and P. Baud (editorial secretary). Masson et Compagnie, 120 Boulevard Saint-Germain, Paris VI, France. Tome XX. By M. Cramer, S. David, J. Doeuvre, A. Etienne, M. Julia, A. Lespagnol, C. Paquot and A. E. Tchitchibabine. 1953. xix + 1404 pp. 17.5 × 26 cm. Broché (2 vols.) 10,560 fr.; cartonne toile (1 vol.) 11,330 fr. Tome XXI. By J. Doeuvre, A. Etienne, P. Jullien, R. Paul, R. Rambaud and H. Wuyts. 1953. xix + 1147 pp. 17.5 × 26 cm. Broché 8,500 fr.; cartonné toile 9,300 fr. Tome XXII. By T. Trefouël, G. Champetier, G. Dupont, H. Guinot, P. Heitzmann, L. M. Labaune, F. Lachampt, J. LeBras, L. Meunier, R. Perron, J. Trefouël and H. Wahl. 1953. xix + 1290 pp. 17.5 × 26 cm. Broché 10,200 fr.; cartonné toile 11,000 fr.

These are the last three volumes (with the general index as Volume XXIII shortly to follow) of the well-known Treatise of Organic Chemistry originally edited by Victor Grignard, thus completing the whole work started in 1935.

As the previous volumes of this valuable collection have not been regularly reviewed, it might be of interest to recall the aim and organization of Grignard's collective treatise which is, according to the author's statement (Preface to Vol. I), not an encyclopedia or a compilation of references. The author's trend is to induce a correct orientation of the research man in the light of modern theories in order to enable him to work successfully on already known but incompletely solved problems as well as on numerous new problems which may be solved only in relying upon a strong knowledge and a real understanding of previously acquired facts. This treatise was therefore written in considering simultaneously a didactic and a critical conception. It avoids the fatigue of interminable references and it tries to conduct the reader to a high point of observation from which it may discover a rather large horizon through a systematic classification of facts, methods and ideas.

In this treatise the aliphatic, alicyclic and aromatic compounds are treated together, whereas the condensed homocyclic compounds form separate chapters just preceding the heterocyclic compounds which are classified according to the total number of atoms and the number and nature of hetero atoms. No attempts are made to explain organic reactions on the basis of electronic theories. In spite of the extended rules of nomenclature adopted at the meeting of the I.U.C. at Liège in 1930, the older Geneva System of nomenclature (1892) has been followed but it was modified and completed by Grignard and his co-workers in order to adapt it to their own system.

In Tome XX the study of heterocyclic compounds (starting with tome XVIII) is continued under the following headings: six-membered rings containing one atom of nitrogen; condensed systems containing a pyridine ring; seven and more membered rings containing one atom of nitrogen; five-membered rings containing two atoms of nitrogen; six-membered rings containing two atoms of nitrogen.

Tome XXI is the last volume in the heterocyclic series. The principal headings are as follows: six-membered rings containing two atoms of nitrogen (continued); heterocycles containing one atom of oxygen, sulfur or selenium and one atom of nitrogen; heterocycles containing three or four hetero atoms; various heterocyclic compounds.

Tome XXII gives a review of industrial organic chemistry. After discussion of the general methods and the most important syntheses applied in modern industry, the following organic industries are more particularly described: dyestuffs; tannins and tanning; high polymers such as plastics, synthetic fibers and elastomers; rubber; soaps and detergents; perfumery; industrial fermentations; chemotherapeutics.

Laval University
Quebec, Canada
J. Risi