O. LAMM, A. S. MCFARLANE, R. SIGNER. Pp. x + 478. 174 figs. New York: Oxford University Press. $12.50.

AN ultracentrifuge is defined by Professor Svedberg as a centrifuge in which convection-free sedimentation can take place. Such an instrument is a valuable tool, first for the determination of particle or molecular sizes and weights and, second, for the purification or concentration of various materials. In this book the authors deal principally with the first of the above applications, together with the design and construction of the various types of ultracentrifuges which they have used.

About four fifths of the book is written by the two principal authors, The Svedberg and K. O. Pedersen, and one fifth by the cooperating authors. Each of the contributors is especially well qualified to discuss his particular topic and the book is thoroughly authoritative.

The subject-matter is divided into four parts. Part I is a detailed and critical discussion of the theory of sedimentation by Svedberg and Pedersen, with a chapter at the end by Kraemer. The equations are derived for the two cases usually employed for the determination of particles or molecular sizes and weights, *i.e.*, for sedimentation equilibrium and for sedimentation velocity. The theory of sedimentation equilibrium is discussed, not only for uncharged particles and molecules but also for the case of salts, colloidal electrolytes and mixtures where equilibrium exists between several components.

Part II describes the construction and operation of the various types of ultracentrifuges. A most interesting review is given by Svedberg, Boestad, and Pedersen of the development of the Svedberg ultracentrifuges, as well as a detailed description of his most recent types now in use at Upsala. These include both the low-speed centrifuges used mostly for sedimentation-equilibrium measurements and the high-speed oil turbine ultracentrifuge with which Professor Svedberg and his students have carried out so many epoch-making experiments. The discussion of the design and construction of the rotors and cells are of special interest to any one interested in centrifuge design, since the principles may be used for any type of rotor. Part II closes with a valuable chapter by Bauer and Pickels on the air-driven ultracentrifuges which they have used in their work.

Part III gives a most useful discussion of the methods of measuring the concentration gradients in the ultracentrifuge cell which are necessary for the determination of molecular or particle weights and sizes. The authors of this part are Pedersen, Lamm, and Kraemer.

Part IV deals with the results obtained with the Svedberg ultracentrifuges. The first section, written by Pedersen, presents and discusses the results obtained with animal and plant proteins. McFarlane contributes a chapter on the plant virus proteins. The second section presents the results on organic colloids (except proteins) and is written by Kraemer, Nichols, Signer, and Pedersen.

The appendix contains tables of constants and other data necessary for calculating the results from the experimental data. The bibliography contains practically a complete list of papers dealing with ultracentrifuge technique and data.

Although, as stated in the preface, the authors have confined themselves to a discussion of their own types of ultracentrifuges and the results obtained with them, the theory and methods presented are largely applicable to any type of ultracentrifuge. Also, the results are illustrative of the usefulness of the ultracentrifuging technique. Professor Svedberg and his collaborators have rendered a great service in writing this indispensable handbook to every one interested in using any type of ultracentrifuge or in the interpretation of sedimentation data.

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SPECIAL ARTICLES

ON THE IDENTITY OF VITAMIN H WITH BIOTIN

IN a recent communication[1] we called attention to the possible identity of vitamin H, the curative factor for egg-white injury in rats,[2] with biotin,[3] a growth factor for yeast, and with coenzyme R,[4] a growth and respiration factor for many strains of legume nodule bacteria. The identity of biotin and coenzyme R had already been indicated by other investigators.[5,6] Our conclusion that vitamin H and biotin were either identical or very closely related compounds was based on the close parallelism that was found to exist in the distribution and in the chemical and physical behavior of the substances, as brought out both by our own experimental work and by data derivable from the literature.

It was found that no important differences in dis-

[1] P. György, D. B. Melville, D. Burk and V. du Vigneaud, SCIENCE, 91: 243, 1940.

[2] P. György, *Jour. Biol. Chem.*, 131: 733, 1939.

[3] F. Kögl and B. Tönnis, *Zeits. Physiol. Chem.*, 242: 43, 1936.

[4] F. E. Allison, S. R. Hoover and D. Burk, SCIENCE, 78: 217, 1933.

[5] P. M. West and P. W. Wilson, SCIENCE, 89: 607, 1939.

[6] R. Nilsson, G. Bjälfve and D. Burström, *Naturwissenschaften*, 27: 389, 1939.

tribution could be discovered, when the differences in sensitivity of the assay methods for vitamin H and for biotin and coenzyme R were considered. The solubilities of these three factors in various organic solvents, their heat stability, low molecular weight, adsorption phenomena, stability toward acid and alkali and the effects of reagents such as nitrous acid, benzoyl chloride, acetic anhydride and lead acetate, all pointed to the probable identity of the factors. The strikingly parallel distribution of biotin, coenzyme R and vitamin H activities in the electrodialysate fractions from our vitamin H liver concentrates added particularly convincing evidence for the identity of the three factors. Additional work on biotin and vitamin H which we have since carried out brought still further confirmation.

Conclusive proof of the identity of these principles, as we previously noted, had to await the testing of the pure substances for the mutual activities. This has now been facilitated through the kindness of Professor F. Kögl, who has placed at our disposition for vitamin H assay a solution of 150 γ of crystalline biotin methyl ester in ethyl alcohol. We wish to take this opportunity to express our sincere appreciation for this generosity and cooperation.

In order to obtain some indication of the level at which the biotin methyl ester should be tested for vitamin H activity by the rat assay method, the yeast-growth activity of this solution was compared with that of a solution of known vitamin H activity. A modification of the method of Snell, Eakin and Williams[7] was employed, using *Saccharomyces cerevisiae* Strain 139 as the test organism. Yeast growth was determined by turbidity measurements in the Klett-Summerson photoelectric colorimeter. The curve obtained by plotting turbidity readings against the logarithm of the concentration of the substance being assayed was used to determine the concentration at which half the maximum increase in growth occurred. The half-maximum growth increase was found to be more accurate than either maximum or minimum growth concentrations for comparison of various samples in the calculation of activity. It was found that biotin methyl ester produced a half-maximum growth increase at a concentration of 1 part in 4×10^9. A vitamin H preparation containing 34 units of vitamin H activity per mg produced the same yeast-growth effect at a concentration of 1 part in 1.36×10^7. It could be predicted, therefore, that the biotin methyl ester should show an activity of approximately 10,000 units of vitamin H per mg by the rat assay method if biotin and vitamin H were identical.

Twenty-six rats showing definite vitamin H deficiency symptoms[2,8] were used for assay of the solution of crystalline biotin methyl ester at various levels above and below the amount indicated by the yeast assay. Subcutaneous administration of the biotin ester brought about complete cure of the skin manifestations and resumption of growth in these animals. The minimum effective dose, within the limits of assay error, was found to be 0.1 γ per rat per day for 30 days. This corresponds to an activity of 10,000 units of vitamin H per mg for the methyl ester of biotin. The most potent vitamin H preparation hitherto reported[1] possessed an activity of 215 units per mg.

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MOBILIZATION OF VITAMIN A BY ALCOHOL

THE important observation of Clausen *et al.*[1] that, in dogs, vitamin A is mobilized from tissue stores by ethyl alcohol, as shown by actual blood analyses, probably applies also to humans. The Pett visual test for vitamin A deficiency,[2] has been correlated with blood analyses.[3] Using this instrument, routine daily tests have been carried out on many people during the past two years. On several occasions unaccountably short recovery times (indicating higher blood vitamin A levels) have been observed the day following the taking of alcohol. Table I shows a few such incidental observations.

TABLE I

Subject	Recovery Times			
	Previous average	1st day after alcohol	2nd day after alcohol	7th day after alcohol
	seconds	seconds	seconds	seconds
A	9	5	6	8
B	10	7	8	9
C	15	8	..	12
D	19	9	9	16

* Smaller values equal higher blood vitamin A.

The observations of Clausen and his colleagues would now appear to explain these findings.

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