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TALBOT presents four reasons why he believes the evidence offered by us falls short of disproof of the binocular synthesis of yellow. Our reactions to his four major points are as follows:

1) A real test of the theory that the yellow sensation results from the combined action of two receptor systems that are qualitatively unique in yielding green and red sensations, respectively, would seem to us to demand the mixture of stimuli that evoke pure green and pure red sensations when viewed independently. The requirement is the same whether the mixture is monocular or binocular. Our treatment of the problem as a specifically binocular one was dictated simply by the historical development initiated by the Hecht demonstration. To select stimuli for the binocular experiment by a criterion which requires that they mix to form yellow monocularly, as Talbot suggests, is, unfortunately, to select stimuli which, viewed independently, evoke yellowish-red and yellowish-green sensations. Just such stimuli have been used by Hecht, Prentice, and Trendelenburg. As we stated in our paper, we have no difficulty in confirming their results.

2) A possible bimodal distribution in the spectral location of pure green seems to us to be irrelevant to both the logical and experimental analysis. The spectral wavelength which evokes a pure green sensation may indeed differ for different observers: witness our own results. Whatever the wavelength of a stimulus that evokes a pure green sensation, by definition it excites no yellow. If our result cannot be generalized for normal observers, a visual mechanism would be required for which the mixture of pure green and pure red sensations would yield an achromatic fusion product when the green process is excited by one wavelength for one observer, and a yellow fusion product when the green process is excited by another wavelength for a different observer.

3) The problem is indeed confused because of the various criteria used for "green." Our criterion was that of "psychological uniqueness" (*d*), and every experimental datum cited in our summary table is a wavelength locus of a "pure hue" based on the same criterion of psychological uniqueness. Any values reported by the investigators we cite, for which different criteria such as *a* or *b* were used, were deliberately excluded from the table.

4) Prentice's stimuli were not selected on the basis of the uniqueness of the green and red sensations evoked by them. Consequently the fact that the peak transmission of his green filter occurs approximately at 530 mμ gives no clue to the spectral locus of pure green for his observers. The narrow band interference filters used by Prentice were selected on the basis of their nonoverlapping spectral transmissions, as a quite logical experimental step in answer to criticisms of the filters used in Hecht's original demonstration. Since there was no attempt to mix a psychologically pure green and psychologically pure red in the Prentice experiment, our analysis of the problem stands as originally presented.

On the basis of both our own experiments and our analysis of the earlier studies we can only reaffirm that, whether a cortical or retinal locus is assumed, "yellow-synthesizing mechanisms" appear to operate only when yellow is already present to some degree in either or both of the "red" and "green" mixture components.

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Book Reviews

Tables for Microscopic Identification of Ore Minerals. W. Uytenbogaardt. Princeton, N. J.: Princeton Univ. Press, 1951. 242 pp. $5.00.

This book as published had its inception in tables prepared by Westerveld, of the University of Amsterdam, before the war. Later, while working in the Mineralogical Department of the University of Stockholm, the author translated and reorganized the original tables, amplified them considerably, and brought them up to date in their present form.

The book will be found to be a usable laboratory manual for the microscopic identification of metallic minerals on polished surfaces. It tabulates in convenient form recent data in a field of considerable importance.

The author records tests for some 230 recognized minerals that are often opaque and also lists a considerable number of discredited species that might otherwise be confused with valid minerals. Mineral tables comprise approximately three quarters of the book, with the minerals arranged in order of increasing hardness, galena, chalcopyrite, and pyrite serving as reference hardness standards to define general groups.

Reflectivity, color, etch tests, Talmadge hardness, and occasional special tests furnish criteria for identi-

fication. The assembly of 441 references that give original data on the minerals listed will in itself be found most useful.

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The Structure of Physical Chemistry. C. N. Hinshelwood. New York: Oxford Univ. Press, 1951. 476 pp. $7.00.

In this book we see physical chemistry through the eyes of a long-time student and distinguished contributor to the field. The author traces the fundamental principles and the interconnections between them in a realm extending to the borders of science. We have pictured for us the molecular chaos in material systems that is measured by entropy and controlled by quantum laws. Maxwell's equations enter naturally into the explanation of the electrical nature of matter, and the theory of relativity relates matter and energy and so measures nuclear stability. Chemical equilibria and chemical kinetics are both examined in their broader aspects, and finally we learn something about the living cell and how it operates. Consciousness itself is examined and is clearly shown to be something quite beyond the scope of contemporary physics and chemistry.

The reader will no doubt enjoy Professor Hinshelwood's clear exposition, but he may often wonder how particular conceptions arose and where he can turn for a more exhaustive exposition of interesting points. He will be obliged to seek such references elsewhere.

Everything considered, one must say that here is a valuable book that should interest many in the broader aspects of physical chemistry.

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Metabolic Methods: Clinical Procedures in the Study of Metabolic Functions. C. Frank Consolazio, Robert E. Johnson, and Evelyn Marek. St. Louis: Mosby, 1951. 471 pp. $6.75.

This volume presents the methods which Dr. Consolazio and his colleagues have found useful in studying the metabolism of human beings. The techniques are described in detail, with instructions for operating apparatus and examples of calculations, so that anyone with basic laboratory training should be able to carry through the analyses. Following each section, a bibliography lists alternative methods, but these are not discussed.

Since the authors present only a single method for most determinations, it is unfortunate that several of their selections are outmoded. For example, the acetylene method for estimating cardiac output has been supplanted by the cardiac catheter. The authors might have increased the value of their manual by explaining the reasons for their choice of method. The addition of a short section giving the specificity of the technique and the expected order of accuracy would also be useful. Moreover, the organization of the book leads to difficulties. For example, the estimation of serum sodium or potassium is discussed in the section on "instrumentation" in connection with the flame photometer and under "biochemistry," but the use of the flame photometer is not even mentioned in the index under "sodium" or "potassium."

The authors are to be censured for suggesting (p. 21) that the same syringe be used repeatedly without sterilization in obtaining blood specimens from large numbers of subjects. Since this introduces a serious risk of disseminating infectious or serum hepatitis, no compromise with complete sterile technique should be permitted.

The purchase of this book is not recommended except for large libraries of research institutions. It cannot be considered as an adequate general guide for the study of human metabolic function, but its usefulness as an adjunct to more comprehensive reference books cannot be doubted.

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Scientific Book Register

Hormones: A Survey of their Properties and Uses. Published by direction of the Council of The Pharmaceutical Society of Great Britain. London: Pharmaceutical Press, 1951. 220 pp. 35s.

Linear Transformations in n-Dimensional Vector Space: An Introduction to the Theory of Hilbert Space. H. L. Hamburger and M. E. Grimshaw. New York: Cambridge Univ. Press, 1951. 195 pp. $4.50.

Phase Microscopy: Principles and Applications. Alva H. Bennett *et al.* New York: Wiley; London: Chapman & Hall, 1951. 320 pp. $7.50.

Nucleic Acid. Symposia of the Society for Experimental Biology, No. 1. Reissue. J. F. Danielli and R. Brown. New York: Cambridge Univ. Press, 1951. 290 pp. $7.00.

The Measurement of Radio Isotopes. Denis Taylor. London: Methuen; New York: Wiley, 1951. 118 pp. $1.50.

The Battle for Mental Health. James Clark Moloney. New York: Philosophical Library, 1952. 105 pp. $3.50.

Energy Sources—The Wealth of the World. Eugene Ayres and Charles A. Scarlott. New York–London: McGraw-Hill, 1952. 344 pp. $5.00.

The Earth's Magnetism. 2nd ed. Sydney Chapman. London: Methuen; New York: Wiley, 1951. 127 pp. $1.50.

The Birds of Greenland, Part III. Finn Salomonsen; illus. by Gitz-Johansen. Copenhagen: Einar Munksgaard, 1951. Pp. 349–608 and 16 plates, with cumulative index. Accompanying map of Greenland, Dan. kr. 10.

Advances in Genetics, Vol. IV. M. Demerec, Ed. New York: Academic Press, 1951. 343 pp. $7.50.

The Conduction of Electricity through Gases. Rev. 3rd ed. K. G. Emeléus. London: Methuen; New York: Wiley, 1951. 99 pp. $1.50.

On Dreams. Sigmund Freud; new English trans. by James Strachey. New York: Norton, 1952. 120 pp. $2.50.

Metabolic Interrelations. Transactions of the Third Conference, January 8–9, 1951, New York. Edward C. Reifenstein, Jr., Ed. New York: Josiah Macy, Jr. Fdn., 1951. 294 pp. $4.00.

Anatomy of the Chordates. Charles K. Weichert. New York–London: McGraw-Hill, 1951. 921 pp. $8.00.