

since to the less important association of eye and ear an entire chapter is given. The consideration of migraine and hysteria leaves much to be desired. The colored pictures of the fundus are rather sketchy. The index is not as complete as it should be to permit rapid reference, nor is the paragraphing well marked. The work of the publisher is excellent as regards paper and type. The unusual breadth of page gives a sense of solidity to the text which is hardly restful.

In spite of these faults and certain minor errors in the spelling of proper names, the book is a creditable one and with its very excellent companion volume will no doubt prove a useful addition to medical literature.

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#### SCIENTIFIC JOURNALS AND ARTICLES.

*The Journal of Comparative Neurology and Psychology* for September is devoted almost entirely to psychological papers. Mr. Charles Scott Berry first gives the results of an investigation of 'The Imitative Tendency of White Rats,' made at the Harvard Psychological Laboratory. One animal was taught various tricks alone and then observations were made to determine how far others would learn the tricks from him by imitation. He concludes that voluntary imitation (Morgan's usage) of a certain type does exist in white rats; and though this is not of as high degree as that discovered by Kinnaman in his experiments with monkeys, it is not different in kind. The next two papers are fragments selected from a large mass of MSS. by the late C. L. Herrick left unfinished at the time of his death. In 'Applications of Dynamic Theory to Physiological Problems,' Dr. Herrick applied in a concrete way to the problems of heredity and vitalism the conception of 'dynamic monism' which he had begun to develop in the philosophical journals. This is followed by a brief note on 'Imitation and Volition,' suggested by one of Professor Mark Baldwin's discussions. In the editorial column, under the title, 'Objective Nomenclature, Comparative Psychology and Animal

Behavior,' Dr. Yerkes critically reviews the work of the objective school, and the methodological problems involved are discussed from a somewhat different standpoint by Dr. Bawden. Book reviews complete the number.

*The Journal of Nervous and Mental Disease* for October opens with an article by Drs. Mills and Weisenburg presenting the following propositions: (1) that the cortical representation of cutaneous and muscular sensibility is independent of motor representation, that it surrounds the motor zone; and that it is subdivided into a mosaic of centers, each center or group of centers being anatomically and functionally correlated to a motor center or centers; (2) that every muscle or group of muscles producing a movement or movements which are represented by separate centers in the cortex is topographically related to a segment of the skin which has also a definite cortical center, this center being correlated anatomically and functionally with the motor center; (3) that stereognostic representation like that of cutaneous and muscular sensibility and of movements has also its independent cortical area and is subdivided after the manner of the motor and sensory areas. This is followed by a continuation of a paper by Dr. Amberg, begun in the September issue, giving the histories of a number of cases of ear affections and mental disturbances.

#### DISCUSSION AND CORRESPONDENCE.

##### ON THE DOPPLER EFFECT.

IN a recent number of *SCIENCE* (Vol. XXIV., p. 250) there appeared an article by Dr. Paul R. Heyl suggesting a plan for increasing the Doppler effect by observing a rapidly moving image instead of a moving source, the motion being magnified by placing the source just outside of the focus of a converging mirror. If, however, we consider that the wave-length of the separate rays (or, if preferred, of the elementary pencils) is independent of their point of intersection—in other words, of the position of the image—it appears that the only modification of wave-length observed in an instrument at rest relatively to the mirror will be due to the m-

of the source, and will be the same as if that were viewed directly. In other words, the change of wave-length depends on the *rate of change of optical path* from the source to the receiving apparatus. If the source is stationary and the mirror moved the effect is doubled whether the mirror is plane or curved.

The fallacy in Dr. Heyl's suggestion appears to lie in his considering a moving image as in all respects equivalent to a moving source. While this may be true as a proposition in geometrical optics, there is the essential physical distinction that the phase of the vibrations issuing from an image depends not only on the vibrations of the original source, but also upon the (optical) distance from that source. Doubtless if we were to follow the image with our spectroscope we should observe a change of wave-length due to the latter cause. However, even if we could surpass the feat of hitching our wagon to a star by hitching our instruments to the much more swiftly flying image, we should again have the same effect as if the source were viewed directly.

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#### SPECIAL ARTICLES.

##### GLACIAL STAGES IN SOUTHEASTERN NEW ENGLAND AND VICINITY.<sup>1</sup>

FOR some years the writer has been engaged on the problem of the differentiation of the Pleistocene deposits of Long Island and southeastern New England. Some of the results have already been published,<sup>2</sup> and reports discussing in greater detail the subdivisions recognized, and their correlation are in prep-

<sup>1</sup>Published by permission of the director of the United States Geological Survey.

<sup>2</sup>'Probable Representatives of the Pre-Wisconsin Till in Southeastern Massachusetts,' *Jour. Geol.*, Vol. 9, 1906, pp. 311-329. 'Probable Pre-Kansan and Iowan Deposits of Long Island, New York,' *Am. Geol.*, Vol. 32, 1903, pp. 308-312. 'Geology of Fishers Island, New York,' *Bull. Geol. Soc. Am.*, Vol. 16, 1905, pp. 367-390. 'Clays of Cape Cod,' Bull. 285, U. S. Geol. Survey, 1906, pp. 432-441.

aration. The completion of the reports, however, owing to the assignment of the writer to other lines of investigation, is likely to be considerably delayed, and it has, therefore, seemed advisable to present a brief statement of the Pleistocene succession in the region in question, as it is understood by the writer, in the columns of this journal.

#### *Pleistocene Subdivisions.*

In the area examined, which includes Long Island, Gardiner's Island and Fisher's Island, New York; Block Island and the coast of Rhode Island, and Martha's Vineyard, Nantucket, Cape Cod and the coast of Massachusetts northward to Boston, the Pleistocene events appear to have been as follows:

1. *Deposition of the Deeply Oxidized Till and Weathered Gravels.*—At Brockton and Stoughton, in Massachusetts, and other points in the vicinity, there are several exposures of bright yellow or red till composed of the disintegrated remains of local rocks occurring in protected spots beneath the younger tills. In most cases these old tills rest on deeply weathered rock surfaces, and are believed to represent preglacial residual soils slightly reworked by the first ice advance, which appears to be pre-Kansan in age.

On Long Island the Cretaceous is overlain unconformably by several hundred feet of yellow-stained gravel containing a few deeply weathered or disintegrated granitic pebbles and an occasional erratic crystalline boulder. It was originally correlated with a part of the Pensauken of New Jersey, but was later given the name Mannetto by Veatch. It is believed to be pre-Kansan and to represent the outwash of the same glacier which further inland deposited the till described in the preceding paragraph.

2. *Long Period of Subareal Erosion.*

3. *Deposition of Granitic Gravels.*—These gravels were noted in 1903 by Veatch in the well borings of western Long Island, and in the following year were recognized by the writer in the cliffs of Block Island, Martha's Vineyard and Cape Cod. They have a maximum thickness of 100 or more feet and consist of