

treatment of protohistoric civilizations—"ancient empires"—in water-tight compartments on a topographical basis, the whole implication of modern research is missed.

The author would appear here to have used sources which either are out of date and now need supplement and correction, or to have no first-hand acquaintance with the material. He is twelve or fourteen years behind current knowledge. The important archaeological discoveries of the prehistoric civilizations of India and China, and the later work in Sumeria of Sir Leonard Woolley (whose name is misspelled), with their influence on outlook and study of the development of the

respective cultures are ignored. In another field the same neglect of recent development is shown when in the account of the British constitution the term 'colonies' is still used, and the constitutional relations of Britain and other constituent members of the British Commonwealth of Nations are described in terms which ceased to be applicable after the passing of the Statute of Westminster.

Prof. Swain does not seem invariably to be too well acquainted with the authorities he cites. He refers to the single volume edition of "The Golden Bough" as entitled "Leaves from the Golden Bough" and as "selected by Mrs. Frazer".

THEORIES OF HEARING

Hearing

Its Psychology and Physiology. By Dr. Stanley Smith Stevens and Dr. Hallowell Davis. Pp. xv+489. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1938.) 22s. 6d. net.

IN spite of all the work which has been done on the ear, it is common knowledge that we still do not know precisely how the ear works. When Weaver and Bray first announced their discovery of the electrical potentials produced by the ear, it looked as if the resonance theory of Helmholtz would have to be finally abandoned. It was found, however, that an incorrect interpretation had been placed on these researches, so that to-day there are probably more believers in the resonance theory than ever before.

It is particularly interesting, therefore, to read this book by Stevens and Davis, since they do not believe in the resonance theory, but in a travelling bulge theory. Now there is nothing particularly new in travelling bulge theories, for they have been proposed from time to time by several experimenters. The evidence put forward by Stevens and Davis is the work of Békésy, who made large-scale physical models, measured the velocity of transmission of the bulge in them, and applied the data thus obtained to the human ear. He also did experiments in which a click and a steady tone are presented simultaneously to the ear.

Now, so far as evidence of models is concerned, a large number have been made. Some of them demonstrated strictly localized vibrations, such as one would expect to find according to the resonance theory of hearing; others, such as those made

by Ewald, showed the development of a number of affected regions for single pure tones, thus suggesting the sound pattern theory. Békésy's models, on the other hand, demonstrated a travelling bulge. It seems to me that until we know more about the physical properties of the cochlea, and the physical properties of these models, we are really not justified in drawing any conclusion from them at all, except that the makers of the models are extremely ingenious. With regard to the evidence provided by the click and steady tone presented simultaneously, the experiments should be repeated and varied in different ways before they can be held to refute categorically any theory.

With regard to the book itself, much may be said in its favour. It states in a precise but easily understood way a large number of the facts which are at present known concerning the ear. Specially good are Chapters vii and viii on combination tones, masking, etc. Practically all the figures are well illustrated, the only unsatisfactory ones being such photomicrographs as Figs. 113, 132 and 134. Fig. 113 is particularly misleading. It shows Reissner's membrane very bent, the tectorial membrane displaced upwards away from the hair cells, and the basilar membrane seriously kinked with distorted arches of Corti attached to it. Now that histological technique can produce sections of the cochlea which show none of these defects, one of these sections should be used as a basis for this illustration in future editions of this book. This is a matter of detail only. The book as a whole is excellent and is strongly recommended to all those whose interests lie in the border line between physiology and physics.

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