

It would greatly facilitate the work of a student if a reference were given in the margin to the chart, which should be consulted in all cases where directions are given for plotting courses or bearings, etc.

On chart vi. the isobar between 28.78 and 29.09 should be 28.94, and not 28.24.

Dr. Fowler omits to notice the great advantage of the "knot." It combines a measure of a time with a measure of distance—one knot signifying one nautical mile per hour, ten knots ten nautical miles per hour.

MENTAL ASPECT OF SOUND.

The Psychology of Sound. By Dr. H. J. Watt. Pp. vii + 241. (Cambridge: At the University Press, 1917.) Price 10s. 6d. net.

THIS volume is written by a psychologist of repute, who is a lecturer on psychology in the University of Glasgow. It is one of the most important presentations of the sense of hearing since the time of Helmholtz. It is true that Dr. Watt discusses hearing more from the psychological than from the physiological point of view; he is less interested in the physiological mechanism than in the mental experiences associated with hearing. Still, the author is familiar with physiological theories regarding hearing and the cochlea. In the eighth chapter he gives an excellent critical account of all the physiological theories from Helmholtz onwards, and discards them more or less in favour of a theory of his own, which he thinks reconciles psychological and physiological data better than any other.

His theory, briefly stated, is that the basilar membrane does not act as a resonance apparatus, but when a sound wave enters the cochlea from the stapes there are variations of pressure at points of the basilar membrane—positive and negative pressures—positive when the pressure is increased by the stapes, negative when the pressure is diminished and backward; and the negative pressure "dissipates itself in all directions." It is not easy to understand the illustrative diagram on p. 164. There remains the doubt whether an accurate analysis can be made of motions in a space of such small dimensions as the *scala intermedia*. Nor is it easy to see what is gained over the resonance theory by the resolution of motions into positive and negative pressures.

Limits of space forbid giving a detailed account of many of the author's views. Pitch is primarily a variation of *quality*, or it includes that within it. Physiologists have used the term "quality" with a different meaning, and they prefer a "quantitative classification" of pitch. Pitch, in our view, depends on the number of pressures on the auditory mechanism, or the duration of each pressure, and this fits in with a theory of resonance. Again, the word "mass," as applied to tones, is liable to lead to confusion. "Bi-tonal mass" is a term difficult to understand; the meaning of tone or blending of tones is clearer if we think of the fusion of two or more waves to form

one. There is an important chapter on the analysis of tonal sequences, and interesting explanations are given of experiences on this subject. The author discusses melody and the formation of scales. "Intensity is not, as is often supposed, the direct basis of auditory localisations, but only the indirect basis. It is required to provide a means whereby the predominance of one order over others may be attained." There must be a predominant order. This is difficult to understand. Surely it is easier to regard intensity as the result of greater or less stimulation? The author gives an admirable summary of his conclusions. His most important point is that the cochlea has few of the characters of an analytic apparatus, and thus much of the resonance theory is discounted.

This is undoubtedly a book on psychology, but it will indirectly be of much service to the physiologist. The physiologist has to explain how the ear works, and he confines himself to the mechanism. The psychologist adds to this, mainly by introspective methods, an attempt to explain the experiences associated with hearing, and the feelings that arise from these. Psychology and physiology are distinct departments of science, and each must be investigated by its own methods. The danger is to allow one province to encroach on the other. One has to remember also that when we listen to a tone, or a combination of tones, as in music, we have to do not only with the cochlea, but with neural processes in the brain and elsewhere. The psychologist may be able to frame theories that will explain these experiences, but neither he nor the physiologist can tell us much of the neural phenomena. We do not accuse Dr. Watt of mysticism. He is too learned a psychologist to fall into this error. An extensive bibliography, enumerating no fewer than 159 separate works, shows how he has drunk deeply at the well-springs of both psychology and physiology. Not a little in this book will awaken reflection. There is an excellent index.

J. G. M.

OUR BOOKSHELF.

Cotton Spinning. By W. Scott Taggart. Vol. iii. Fourth edition. Pp. xxviii + 462. (London: Macmillan and Co., Ltd., 1916.) Price 10s. net.

MR. SCOTT TAGGART'S treatise has become a standard book of reference on cotton spinning, and deservedly so; the illustrations are excellent, the descriptions of the various pieces of mechanism are clear and adequate, and the scheme of the work is based upon the regular sequence of the movements dealt with.

Vol. iii. is devoted to mule and ring spinning, to winding, doubling, reeling, gassing, bundling, mill planning, and humidity. It also contains a chapter on "Useful Information." In most cases attention has been given to the relative importance of the several sections into which the treatise is divided, but more care might, with