

comparison of the visible spectrum with an octave in music. The analogy has been fortified in detail by comparing the angles of refraction of different coloured rays through glass with the intervals in a musical octave. A glance at a modern glass list would immediately make one pause before trusting too much to a theory based on the dispersion of one particular glass. But there are in any event several difficulties about this octave business, not the least of which is that, as reported recently, young observers who have been operated on for cataract can see the near ultra-violet, and at a wave-length of 3,600 Å. the colour is blue. On the octave theory, one would presumably expect it to be red. However, there is little scientific information in this book more recent than Newton's investigations; there is certainly no mention of the hue discrimination curve nor of the locus of the spectrum colours in the colour triangle—two vital pieces of information in a discussion of this sort.

To overcome the difficulty that normally only one octave is visible, the author suggests that "the

spectrum octave can be extended into a gamut of many octaves by definite manipulation in degrees of luminosity. [He appears to mean saturation.] But this extension does not find expression in terms of wave-vibration." Yet if the analogy is to find expression in any terms at all, wave-vibrations are the only possible terms.

As an instance of the misinterpretation of scientific data, the author refers to the fact that so-called monochromatic radiations may, when examined in an instrument of high chromatic resolving power, be found to break up into several components. He then concludes that the overlapping of these components may be responsible for the whiteness of different parts of the spectrum. Unfortunately, one cannot reasonably expect an artist to see the fallacy in an argument of this kind.

The trouble is that this book is symptomatic of the wide gap between the artistic and scientific approach to colour. Is it too much to hope that something may be done before long to bridge it?

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MUSICAL ACOUSTICS

The Musical Ear

By LI. S. LLOYD. Pp. ix + 88 + 2 plates. (London, New York and Toronto: Oxford University Press, 1940.) 6s. 6d. net.

MR. LLOYD has done a public service by writing a book on musical acoustics which, while giving the latest results of scientific investigation, approaches the subject from the point of view of the musician. Too often the latter has had to complain of the attitude which many who write for him adopt; that he ought to have taken a course in mathematics and physics at least up to university intermediate standard before reading their works, forgetting that, so overcrowded is the curriculum to-day that a knowledge of physical acoustics cannot be assured even to science students unless they have taken physics as one of the principal subjects of a degree course. It is true that it is impossible to write on sound nowadays without introducing concepts like frequency and phon or their equivalents, but Mr. Lloyd wisely does not confound his readers with an introductory chapter or appendix containing a long list of definitions. Instead he cleverly avoids defining many of the terms he has to employ, leaving the reader to sense their meaning from the context.

As for the contents, they form a series of essays on topics which embrace the relationships between

physical acoustics, musical sounds and theory, and the ear—especially the ear. The author elaborates a point which the physicist and—more so—the musician is apt to overlook, namely, that the ear is, or should be, the final arbiter in sound experiments and that as an organ of response it has its limitations and idiosyncrasies. To the best of its ability it measures loudness, not intensity; pitch, not frequency; timbre, not overtone structure. In other words, a treatise on acoustics has a serious lacuna if it does not deal with the sensation of hearing. Pre-occupied with this aspect of music, the author is a little severe on Ellis who did, according to his lights, expound and amplify Helmholtz to the English reader. Mr. Lloyd also has an affection for mechanical rather than the more recent electrical methods of analysis and synthesis of musical sounds. In the essay entitled "Electronic Organs and the Phonodeik", the reader will find nothing about the former but a great deal about the latter. No one decries the importance of the pioneer work of Miller in this field, but the reader is not told that Miller had to apply a rather arbitrary calibration correction to his analyses with the phonodeik, a calibration which is largely avoided in modern electric wave analysers, by the possibility of omitting resonance cavities and bodies which were necessary in mechanical recording to produce the desired amplification.