sation corresponds to blue and yellow, the blue rays exciting it in one direction and the yellow rays in the other. The other source corresponds to red and green, and is excited in like manner. It will at once be seen with what admirable simplicity this will explain colour-blindness, avoiding the violence done to the evidence by the Young-Helmholtz doctrine. Normal-eyed persons possess both sources of sensation; colour-blind persons possess only one. The usual case is when the red-green source is absent, the patient seeing only blue and yellow; but the other defect is possible, giving blindness to blue and yellow, and vision only of red and green; and Dr. Stilling, who strongly espouses the theory, states that rare examples of this have been found. If both sources of sensation are absent, the patient sees only light and shade, and this case also is said to have been practically known.

It is a pity Dr. Jeffries has omitted to mention this theory, which, if it should be substantiated by further inquiry,[1] bids fair to be a most valuable contribution to our knowledge. In the meantime the phenomena of colour-blindness, from the important bearing they have on the nature of colour-perception generally, require much further careful investigation.

WILLIAM POLE

OUR BOOK SHELF

Elementary Lessons on Sound. By Dr. W. H. Stone, Lecturer on Physics at St. Thomas's Hospital. (London: Macmillan and Co., 1879.)

SINCE the publication, some five and twenty years ago, of Helmholtz's great work on musical acoustics, the study of the nature of sound has become popular. The ordinary phenomena of hearing must interest every one; but it is to the thoughtful student of music that the subject presents its chief attractions. We cannot imagine any intelligent musician who will not be desirous to know something of the foundation of the wonderful fabric he has to deal with, and to learn how the principles of science bear on the practice of the art.

It is well, therefore, that Messrs. Macmillan have included among their School Class Books one which gives, in a very small compass, a large amount of information as to the laws and phenomena of sound. The author has not only extracted the essence of what is contained in bulky and expensive treatises, sometimes in foreign languages, but he has also given much additional information from memoirs and transactions of scientific societies out of the reach of the ordinary public.

The application of acoustics to musical instruments is a useful addition, the subject being one which the author has made specially his own. He has also stated some of the simplest facts of the connection between acoustical phenomena and the structure of music; but this is too wide a subject, and involves far too complicated considerations to be fully dealt with in an elementary work of this kind.

We notice a few trifling errors, as, for example, on page 3, the monochord can hardly be said to be "named after" Pythagoras; and Tartini's *terzo suono* was intended by him rather as a guide to correct double-stopping than "tuning." On page 11, line 7, the expression "first partial" is probably meant to be "first overtone." On page 76 a pretty contrivance, by Mr. Francis Galton, is ascribed to Capt. Douglas Galton. These things are, however, of little consequence.

[1] It may be mentioned that one of the main points in the theory has lately received unexpected and powerful support from the brilliant discoveries of Bell and Kühne in regard to the physiology of the retina.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Local Colour-Variation in Lizards

THE interest which some notes by Messrs. Wallace and Giglioli (published in NATURE) have called forth with regard to the local variation of colour in reptiles causes me to publish these few lines.

Since the year 1874 I have been carefully studying this subject, and therefore wish to remove the generally prevailing opinion that no endeavours have yet been made to explain it. I have not thought it necessary to write this before, thinking that my works touching this subject were known to naturalists, or would have become known through the mention Mr. Carpenter makes of them. Such, however, is not the case. Neither English nor Italian zoologists have taken any notice of the newer German publications concerning the local variation of colour in lizards. They content themselves with merely mentioning many new and truly interesting instances of this variation, but leave unnoticed all attempts made to obtain an explanation of the same.

The first effort to explain this appearance was made by Mr. Eimer in 1872, at the time that the beautiful black and blue lizard was discovered on the Faraglioni rocks, near Capri. Prof. Eimer tries to explain this change of colour in the *Lacerta muralis* (which is green both on the Continent and the Island of Capri) by attributing it to an adaptation to the colour of the Faraglioni rocks. However, as those rocks are not of a bluish-black, but rather a yellowish-red colour, intermixed with a little gray, and as, moreover, the lizards there have no enemies against which they require protection, and therefore no adaptation is necessary, I considered Prof. Eimer's explanation a failure, and at the same time I tried to confirm by fresh facts my hypothesis made in 1874 ("Ueber die Entstehung der Farben bei den Eidechsen," Jena, 1874). This hypothesis, which, it is true, has till now met with little approval, is as follows:—The skin of the lizard has two layers of pigment. The black pigment, which lies lowest, gets the power, under the concentrated influence of the sun, to leave its motionless state, and is made to rise by the contraction which the nerves exercise on the cells containing it, and by forcing itself more or less upwards through the elements of the pale layer of pigment, gives us the impression of different colours. That change of colour which we are able to observe in chameleons in a short space of time, under the condition of a frequent change of light, takes place with lizards only in the course of ages, embodying itself in manifold degrees of development, and provided the animal does not change the locality, remains as a distinguishing characteristic of the form. If, however, the lizard changes its locality, if it is isolated on a rock or islet which has separated itself from the mainland, and is entirely and constantly exposed to the rays of the sun, as must naturally be the case on rocks which, like the Faraglioni or the Island of Ayre, are void of all vegetation, in that case, I say, the black layer of pigment is set in motion, and by constant successive risings to the surface at last gains a definite superposition over the yellow pigment, as has been the case with the black Faraglioni and Lilfordi lizards.

This phylogenetic development of colours can be traced (as I have already mentioned in the year 1874) by the individual development of colour in the lizard, but necessarily only under the constant strong influence of the sun on young individuals. Dr. Braun, in his work on the *Lacerta lilfordi*, informs us that the young lizard of the Island of Ayre has exactly the same colour as its typical form on the larger Balearic islands, and only turns black in the course of its growth.

Though we can only observe the turning black of these lizards in the individual growth of the animal, we can obtain a returning of the full-grown animals to their original paler colours by artificial means, that is, by preventing the rays of the sun from falling on them perpendicularly. By these means I completely discoloured numbers of the Faraglioni lizards and the brown ones from the island of Ponza. The former turned bluish-green, the latter brownish-green.

Before I pass on to an enumeration of the above-named trans-

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