displacement occurring in the phylogeny of the Hydroids. In the actual development these stages are repeated, and the primitive germ-cells migrate from the ancestral to the present position. From this it followed that the germ-cells contained something *sui generis:* something that could not be derived from the tissue-cells.

The first and third essays, on the other hand, show how a more or less theoretical consideration of death as a factor in biology led to the establishing of an actual continuity of life from individual to individual in genealogical series. In all animals above those consisting essentially of a single cell, this continuity of life is confined to the generative cells, and it is the other, or somatic, cells alone that are necessarily mortal.

Such converging lines led to the provisional hypothesis of a continuity of germ-plasma as the basis of heredity—the hypothesis in fact, to take a simple instance, that it is the eggs that have been forming the hens, and not the hens the eggs, and so with their ancestors from the remotest of times. With this new view came the discussion of the inheritance of acquired characters and the brilliant interpretations and investigations of parthenogenesis and polar bodies. Essay VII., on the supposed botanical proofs of the transmission of acquired characters—which has not before appeared in any form in English—and Essay VIII., on the supposed transmission of mutilations, are valuable contributions to the questions raised by the general theory.

There can be no doubt but that Dr. Weismann's essays will be for long a source of inspiration and stimulus to supporter and adversary, and this valuable translation must prove of great service in making better known what, if it never advances beyond the stage of a provisional hypothesis, has already been of the utmost service to biology.

P. C. M.

OUR BOOK SHELF.

Chambers's Encyclopædia. New Edition. Vol. IV. (London and Edinburgh: W. and R. Chambers, 1889.)

In this volume of the new edition of "Chambers's Encyclopædia," subjects from "Dionysius" to "Friction" are dealt with. So far as we have been able to test it, we have found that the volume is in no respect inferior to its predecessors. The subjects include some that are of great scientific interest and importance, and these have been intrusted to writers whose names are a sufficient guarantee for the character of their work. Prof. Tait writes the article on force, Dr. W. Peddie those on energy and ether, and Prof. Cargill G. Knott that on electricity. Dynamos, the electric light, and the electric railway are described by Prof. J. A. Ewing. The theory of evolution is presented by Prof. Patrick Geddes, who, while expounding his own doctrine, tries to give a perfectly fair account of the opinions of thinkers with whom he only in part agrees. Dr. H. R. Mill has a good article on the earth, and Prof. James Geikie discourses with his usual clearness on Europe and on earthquakes. To the article on France, Prince Kropotkin contributes the geographical section. Prof. A. H. Keane is the author of the article on ethnology; and Dr. Henry Rink has a short but interesting paper on the Eskimo. These and other articles on scientific subjects in the present volume cannot fail to maintain the high reputation of "Chambers's Encyclopædia" for accuracy and thoroughness.

Farm Live Stock of Great Britain. By Robert Wallace, Professor of Agriculture at the University of Edinburgh. Second Edition. (Edinburgh: Oliver and Boyd. London: Simpkin, Marshall, and Co. 1889.)

This is a second edition of a work already reviewed in Nature. The most important point of difference between it and the first edition is the introduction of 100 excellent plates, executed by Angerer and Göschl, of Vienna, from photographs taken from life. Pictures are, no doubt, of great assistance to a description, but, as the author justly observes, photographs, although accurate, fail in some respects to do justice to animals. This he attributes to the awkward positions they assume while standing, and the constancy of their motion while they remain on their limbs. It is also, no doubt, partly due to the higher elevation of the eye of the observer than the camera as usually employed. The levelness of the back and of the belly lines is destroyed by the camera when placed horizontally so as to strike the broadside of the animal. Prominences are shown against the light, which in ordinary observation do not disturb the levelness of the carcass. The work has a strictly pastoral and agricultural interest.

Days with Industrials; or, Adventures and Experiences among Curious Industries. By Alexander H. Japp, LL.D. (London: Trübner and Co., 1889.)

This book is a reprint, with additions, of a number of articles which have appeared from time to time in various periodicals of a popular character. The articles deal with such subjects as quinine, rice, pearls, amber, common salt, Burton ale and Dublin stout, petroleum, canaries, bedsteads, railway-whistles, knives, forks, and postage-stamps—as heterogeneous a mixture, in fact, as the contents of Mrs. Jellaby's famous cupboard. Dr. Japp writes in a chatty and agreeable style, and his book may be safely given to young people, with the certainty that they will imbibe no false notions of science.

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 intended for this or any other part of* Nature. *No notice is taken of anonymous communications.*]

Lamarck *versus* Weismann.

I had not intended to reply to Mr. Cunningham's criticism of a passage in my book which he thinks is pure Lamarckism (see Nature, July 25, p. 297); but now that Prof. Ray Lankester adopts the same view, I will make a few remarks upon the case. Mr. Cunningham italicizes the words, "the constant repetition of this effort causes the eye gradually to move round the head till it comes to the upper side," and claims this as a Lamarckian explanation. But if we italicize the following words, which occur three lines further on, "*those usually surviving whose eyes retained more and more of the position into which the young fish tried to twist them,*" we shall see that the survival of favourable variations is, even here, the real cause at work. For the transference of the eye to the upper side was a useful change—perhaps, under the peculiar conditions of existence and development—an absolutely essential one. The amount to which the eye could be twisted and retained in its new position was variable, as all other such characters are variable. Those individuals who had this faculty in the greatest degree were among those that survived, and it is not at all necessary to assume that any portion of the change *due solely to the effort* was inherited, but only that those individuals which were the most favourably constituted in this respect transmitted their peculiar constitution to their offspring, and thus the twisting would take place earlier and earlier in the development of the individual Even Darwin himself, who believed in the heredity of acquired variations, says that "the *tendency to distortion* would no doubt be increased through the principle of inheritance"; and this is really all that is necessary. In most of the higher animals symmetrical development of the two sides of the body is of vital importance, and is strictly preserved by natural selection ; but more or less defect of symmetry often occurs as a variation or monstrosity, and in cases where such asymmetry was useful these variations would be preserved and increased by selection and heredity. An altogether erroneous view is taken of the fact of effort being used in this case, as if it were something unusual. But in all cases selection produces changes which are useful and whose use is often indicated by effort. The giraffe uses effort in stretching its neck to obtain food during a drought ; the antelope exerts itself to the utmost to escape from the leopard ; but it is now recognized that it is not the individual change produced by this *effort* that is inherited, but the favourable constitution which renders extreme effort unnecessary, and causes its possessors to survive while those less favourably constituted, and who therefore have to use greater effort, succumb. In the case of the developing flat-fish also, the effort indicated the direction of the useful modification, and any variations tending either to the right kind of asymmetry or to a mobility of the eye, admitting its being twisted and retained in its new position, during the growth of the individual, would be certainly preserved.

I wish to take this opportunity of thanking Prof. Ray Lankester for his careful and appreciative review of my book. I am too well aware of my own deficiency in training as a naturalist not to admit all the shortcomings which he so tenderly refers to. It is quite refreshing to me to read at last a real criticism from a thoroughly competent writer, after the more or less ignorant praise which the book has hitherto received. I admit also that the term "laboratory naturalist," to which he demurs, was not well chosen. I meant it as the opposite, not so much to "field naturalist" as to "systematic naturalist" ; and it still seems to me that the gentlemen he refers to as not being "laboratory naturalists" are still less "systematic naturalists," in the sense of having specially devoted themselves to the observation, description, and classification of more or less extensive groups of species of living organisms. ALFRED R. WALLACE.

A Mechanical Illustration of the Propagation of a Sound-Wave.

HAVING to prepare some lectures on sound, I wished, if possible, to illustrate, without any very complicated apparatus, the way in which a sound-wave is propagated.

The following method suggested itself to me. As I have not met with the method while examining a large number of works on sound and wave motion, I venture to send a description of it to NATURE, as it may perhaps be of use to some students of acoustics.

A row of pendulums of equal length, *a*, *b*, *c* . . . *l* (Fig. 1) are suspended from a rod AB ; in order to start the pendulums,

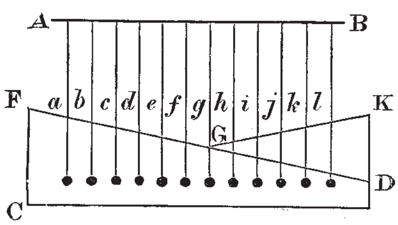

FIG. 1.

the bobs are held against an angular-shaped board, FCD, the rod being held in a plane slightly behind the plane of the board ; if now the rod and pendulums be raised together vertically, *l* will first swing, then *k*, and so on, till all are free : when the pendulums are raised with a uniform velocity, then each pendulum starts at an equal period of time after the one which is next to it ; the result is that a wave-motion is seen to run along the line of bobs as they vibrate to and fro. Such an arrangement has been used to illustrate wave-motion, as each bob moves with harmonic motion. But such an arrangement does not illustrate directly those compressions and rarefactions whereby sound is propagated. A slight movement, however, of the rod at once makes it do so. If, while the pendulums are vibrating, the rod from which they are suspended be turned in the horizontal plane through a right angle, the direction of the swing of each pendulum is not changed, and all the pendulums swing in the same plane. This will become clear from (Fig. 2), where the pendulum bobs viewed along OX appear to trace out wave-motion ; the relative position of the bobs after the rod which supports them is turned through a right angle is shown along OY ; the motion then illustrates mechanically those movements of air-particles which, when in compression and rarefaction, propagate a sound-wave. If the rod be turned back through a right angle, the wave-motion is again restored. The illustration must be taken with the obvious defect, viz. that the bobs move in arcs, and not in straight lines.

Care should be taken that the amplitude of vibration be not greater than the distance between the points of suspension minus

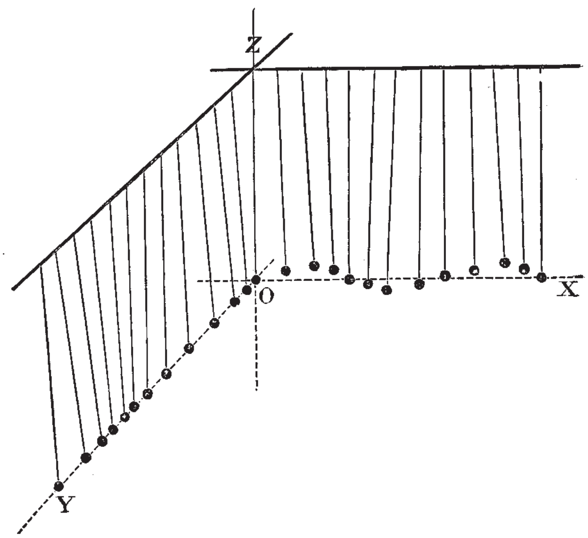

FIG. 2.

the diameter of a bob, otherwise the bobs will hit each other when vibrating in the plane YZ.

Twelve pendulums made of lead bullets 1·5 centimetre in diameter, suspended from threads 30 centimetres long, with a distance between each of 5 centimetres, were found to answer well by the author.

If the board used for starting the pendulums be made of the angular shape, FGK, then the movement of the bobs in their second position illustrates the propagation of sound on each side of its origin. FREDERICK J. SMITH.

Trinity College, Oxford, October 1.

On some Effects of Lightning.

THE twisting of one of the two trees near St. Albans, which were struck in such a remarkable manner by lightning, may well have been caused by the fall of the top of the tree, as Mr. Griffith suggests, and not directly by the lightning.

I have been unsuccessful in ascertaining whether the core of the tree is situated nearer that side where the explosion seems to have been most violent; but a more detailed examination only enforces the conclusion which Mr. Griffith and I arrived at, that the explosion must have occurred inside the stem, if not actually at the core of the tree.

The effects in this case can meet with no explanation from the supposition that the lightning passed between the bark and the tree, generating thereby sufficient steam to blow off the bark and shatter the stem—an explanation which Mr. Maclear suggests in his letter of September 25. I doubt if any source of heat would ever convert water so quickly into steam as to endow it with the power which dynamite has of shattering a hard object lying in contact with it, while the gases formed are restrained by the comparatively feeble resistance of the bark and outer air ; nor can we suppose that sufficient heat could pass into the stem to generate steam there adequate for such an explosion, even if the uncharred condition of the wood did not prove incontestably that the temperature had not been raised very high. It seems more probable to me that such explosions must be caused by the lightning electrolysing the liquids in the stem, and