

trolled by reason, and not to make the wrong he has done to science greater by continuing to persist in it regardless of the published demonstration of his error.

One curious feature of the whole popular view of the anti-vivisectionist campaign is the general belief in the good faith of Miss Cobbe. To men of science her methods have been familiar ever since the commencement of the agitation, and more especially since they were clearly displayed in the published trial of Adams *v.* Coleridge. By the general public, however, she was regarded as a fanatic, but trustworthy. After this latter-day exposure at Folkestone to which she has been subjected we hope that such credulity has at last seen its end, for by the production of Miss Cobbe's latest book, "The Nine Circles," and by comparing it with the originals of the scientific papers from which her statements were alleged by her to be taken, Mr. Horsley had no difficulty in convincing the Congress that her statements of facts can no longer be relied upon.

It is an old story that a lie dies hard, but die it does at last, and the proceedings of the Church Congress have greatly accelerated the end.

Nothing can do this better than for scientific investigators to patiently instruct the public. At the Church Congress this heavy task fell on Dr. Rafter, who by way of answer to the vague rhetoric of the Bishops, piled fact upon actual fact until his audience showed how they welcomed the state nents of truth as a counterpoise to Episcopal excommunication.

The painful position of medical men who can be found willing to sanction such an agitation was well exhibited by the action of Mr. Lawson Tait, who having publicly charged Church Congress officials with excluding him from the meeting, was positively proved to have withdrawn himself, the withdrawal being contained in his letter read to the Congress by the chairman of the Subjects Committee, the Bishop of Dover.

Lastly, on the broad question of utility, no member of the Church would, we are sure, feel justified in contravening the view that the general regard shared by all Englishmen, and expressed in the above-mentioned resolution of the International Medical Congress, for the proper, that is, humane, use of animals, is ample surety that whether for the sake of food or pursuit of knowledge, the object is obtained at a minimum cost of pain.

The most extraordinary illogicality was displayed on this very point by Bishop Moorhouse, of Manchester, for while declaiming against the killing of animals to gain knowledge, he clamoured for liberty to destroy any number to preserve the volume of his voice.

But if we were to speak of the illogicality of the anti-vivisectionists there would be no end, seeing that as they do not or will not learn the truth, they live in a circle of contradictions. Suffice it to say, that we believe the open discussion of the subject at the Church Congress will do more than anything to show the public that the feeling exhibited by the anti-vivisectionists is one of unmitigated hostility to science, and not one of genuine anxiety for the humane treatment of animals devoted to the service of man.

NO. 1198, VOL. 46]

THE NEW VOLUME OF WEISMANN.

Essays on Heredity. By Dr. A. Weismann. Authorized Translation. Vol. II. Edited by E. B. Poulton, F.R.S., and A. E. Shipley. (Oxford: Clarendon Press, 1892.)

IN this second volume of the new edition of Dr. Weismann's essays there are brought together four essays which did not appear in the first edition; they are in a convenient form, well translated, and well printed.

Nothing is more curious than the public appreciation of Weismann's essays, for in them is no trim, nicely balanced, carefully elaborated statement of his biological theories. The successive essays appear as they were published. You have the theories in their making, stretching from essay to essay; alive, contradictory, disjointed. This historical method of publication is a thing to delight the student of biology, but, one had thought, a torture to the precisian and caviare to the general; yet the public continue to buy, discuss, and no doubt read his works.

In "Retrospective Development in Nature," Dr. Weismann describes cases of vestigial organs or rudimentary functions. To explain the occurrence of these, the transmission and accumulation of degenerate characters produced by disuse is unnecessary. In every organ, as in every animal, variations occur; in every generation unsuitable variations are weeded out, and so the organ or the animal remains adjusted to its environment, or becomes more perfectly adapted to it. But when a change of habit or of environment occurs, as when an eyed animal takes to living in dark caves, or when an animal that has been saving its life by swiftness comes into a region devoid of enemies, the less far-seeing or the less swift are not more quickly killed than their better endowed neighbours. So far as sight or swiftness are concerned, a condition of panmixia occurs, and the organs of sight and flight slowly degenerate.

The argument in "Thoughts on the Musical Sense in Animals and Men" is subtle, ingenious, and less familiar. In insects and birds males are the musicians, and sexual selection is a sufficient explanation; but it is not so in man. However, in the mammalia the organ of hearing is remarkably developed. In the auditory organ of a rabbit there are structural arrangements for nearly two thousand note sensations, while a concert grand piano contains only eighty-seven different notes. For the needs of life, the thousand gradations of sound in the woods and the field, of the hunter and the hunted, the mammalian organ is adapted. Music itself is an invention, and from the rude melodies of primitive man to the art of Beethoven and Chopin, it has been progressively developed as the intellectual faculties have been developed.

The third essay, "Remarks on certain Problems of the Day," is specially valuable, as in answer to certain criticisms by Prof. Vines¹ many doubtful points are explained. Specially to be noted is the clear re-statement of Weismann's contention that the nuclear substance is the sole bearer of hereditary tendencies, and the new evidence for it contained in the researches of Boveri and O. Hertwig. Equally noteworthy is the admission, in

¹ NATURE, October 24, 1889.

reply to Prof. Vines' citation of the parthenogenetic fungi, that not only sexual forms may vary into new species.

It is to the last essay, that on "Amphimixis, or the essential Meaning of Conjugation and Sexual Reproduction," that most attention will be directed. Here there is a full statement, with important additions and alterations of the central part of Dr. Weismann's theories. However they may bulk in public imagining, questions of acquired characters, of retrogressive metamorphosis, and so forth, are side issues of a search for the morphological expression of the processes of variation.

Originally Weismann explained the two successive divisions of the nucleus of an unfertilized egg which form the two polar bodies as, in the case of the first, an extrusion of that nuclear plasma which, having served to guide the maturation of the egg, became useless when the egg was mature; and in the case of the second, as a halving of the nuclear substance to make way for the incoming sperm-plasm.

In parthenogenetic ova, one division and only one was predicted and found. It was suggested that parallel processes occur in spermatogenesis.

Subsequent research by O. Hertwig and others has brought to light these parallel processes, and Weismann, seeking for a sign, got rather more than he anticipated. For the processes in spermatogenesis show first a doubling of the germ-plasma, and then two successive reducing divisions, and it has been shown that exactly this happens in ova also. Accordingly, Weismann rejects his original explanation of the first polar body as an extrusion of ovo-genetic nucleoplasm, and the new problem comes to be, what is the cause of that doubling of the nucleoplasm which in primitive sperm and germ cells precedes the two reducing divisions?

Weismann supposes that the ancestral plasms or units of heredity, to which he gives the name "ids," are arranged in "idants," or nuclear rods. The doubling process takes place normally by longitudinal division, and simply doubles the number of idants without altering the arrangement of "ids." By this method the number of possible combinations is increased without alteration of the ids. The process is a mechanical one to increase the chances of combinations when the idants of sperm and germ cells meet. If the idants were coloured rods, to be arranged in pairs—say black, white, red, and yellow for four sperm idants, and orange, green, blue, and crimson for those of the egg-cell—obviously only four pairs are possible. The black would have to unite with one of the four others. But if before the arrangement in pairs each rod were split in two, there could be two combinations for black, and so on for the others. No doubt in many cases the number of idants is far greater than four, and the mechanical arrangement for variations correspondingly greater. From the large number of possible combinations there come the relative few individuals of the next generation, and there is thus a basis for the lawless and apparently capricious appearance of varieties. Next in importance comes Dr. Weismann's belief, based on theoretical considerations, and supported by experiments on *Cypris*, conducted for seven years, that in parthenogenetic reproduction heritable variations may occur. But they are far less frequent than in sexual reproduction. But the whole of

this essay is full of intricate and curious speculation, speculation which will have to come before every student of biology, and which, whether much or little of it becomes incorporated in the body of accepted knowledge, will at least play a large part in guiding and stimulating present research.

P. C. M.

ELEMENTARY CHEMISTRY.

The Standard Course of Elementary Chemistry. By E. J. Cox, F.C.S. Pp. 344. (London: Edward Arnold.)

THIS book consists of five parts, which may be obtained separately or bound up in one volume. It is based upon the syllabus prescribed by the Education Department for teaching chemistry as a class or specific subject, and professes to lead the beginner from the "familiar" to the "less known" by means of "investigation," the teaching thus afforded being regarded as a branch of mental education as well as of useful knowledge. The five parts deal respectively with the properties of the common gases, the atmosphere, water, carbon and non-metallic elements, and with metallic bodies, combination, symbols and formulæ.

The general plan of the book and the manner in which the subject is approached, have a good deal to recommend them; the detailed treatment contains, however, much which could be improved, and unfortunately much which the learner will have to forget as he progresses in the study of his science. In the opening chapter, evidently for the sake of simplicity, the author uses the term heat in place of temperature. More confusion on the subject of heat is made later on by the use of equations, such as



which appears to attribute to heat a material existence; and even more unsatisfactory are bald statements to the effect that "no heat is produced in the formation of a mixture. Heat is produced in the formation of a chemical compound."

Considerable space is occupied in the comparison of the affinities of the elements. Because certain metallic oxides, including iron-oxide, are reduced when heated in a stream of hydrogen, the affinities of the metals for oxygen are said to be weaker than that of hydrogen for oxygen. In the case of iron and steam the author has to note that the inverse change—the oxidation of the metal by steam—readily occurs, and that the former statement as to the affinities of iron and hydrogen for oxygen, is apparently contradicted. This contradiction might have indicated the futility of attempting to compare affinities in a general way and not with reference to the special conditions under which the experiments were performed. The inverse change in the case of iron is said to occur when the "temperature" is favourable, but in reality the active masses of the reacting materials determine the direction of the change.

Inaccurate statements are numerous. Hydrogen is said to form "one-third part of water by volume," "a formula" is stated to "represent a molecule," and a base is given as "a compound of a metal with hydrogen and