

body takes place at different stages. At first the twist is almost exclusively confined to the fore part, but when this amounts to about 180 degrees the rear part of the animal turns. M. Marey is of the opinion that an inspection of the figures altogether excludes the idea that the animal uses the hands that let it go as a fulcrum by means of which a movement of rotation is obtained. The first few images in each of the two series show that at the beginning of the fall the cat exhibits no tendency to turn either one side or the other.

As to the hypothesis that the resistance of the air affords a means of turning, this also appears to be inadmissible; because, on account of the tumbling motion of the animal, if this resistance had an appreciable effect, it would produce a rotation in the opposite direction to that observed.

M. Marey thinks that it is the inertia of its own mass that the cat uses to right itself. The torsion couple which produces the action of the muscles of the vertebra acts at first on the forelegs, which have a very small motion of inertia on account of the front feet being foreshortened and pressed against the neck. The hind legs, however, being stretched out and almost perpendicular to the axis of the body, possesses a moment of inertia which opposes motion in the opposite direction to that which the torsion couple tends to produce. In the second phase of the action, the attitude of the feet is reversed, and it is the inertia of the forepart that furnishes a fulcrum for the rotation of the rear.

#### BIOLOGY IN THE UNITED STATES—A PROSPECT.<sup>1</sup>

THIS volume is slightly larger than its predecessor published in 1891, and is an advance upon it in the number and class of its illustrations. During the interval of publication of the two volumes, much of the work announced in the first one has appeared in full; and the present one shows that although, perhaps, more might be made of the resources of the Wood's Holl Laboratory and its rich surroundings by a better appreciation on the part of the scientific public, there is no falling off in either the energy or enthusiasm of its founders and chief supporters. The ten lectures reported in this volume are chiefly special ones, given by investigators who undertake to review their chosen field of labour, and to set forth the results of their own inquiry—it being an avowed object to bring forward unsettled problems of the day, and discuss them freely. The lectures are published for the first time, with the exception of that which is the most striking of the series and one of the most remarkable contributions to recent biological literature, viz. Prof. C. O. Whitman's thesis on "The Inadequacy of the Cell-theory of Development," originally read before the Zoological Congress of the World's Columbian Exposition, and already reprinted in the *Journal of Morphology*. Prof. Whitman's work in this department dates from his inaugural dissertation for the degree of Doctor of Philosophy in the University of Leipzig, dealing with the embryology of *Clepsine*, in which he laid the foundation of his now famous teloblast theory. The researches which this essay has provoked rank foremost in interest among all those recently devoted to the study of the germinal blastemata.

No one has more assiduously followed up Prof. Whitman's suggestive lines than Prof. E. B. Wilson, whose lecture on "The Mosaic Theory of Development" ranks first in order in the present volume. His recent work on the cell-lineage of *Nereis* is second only to that of Whitman in interest and importance. His present treatise

is a review of the embryological work of the last decade in its bearing upon the biogenetic law. Prof. Whitman would seek the secret of organisation in ultimate elements of living matter "for which *idiosomes* seems an appropriate name"; Prof. Wilson, that of differentiation during development in the interaction of the embryo-cells. There next follows a lecture by Dr. E. G. Conklin, on "The Fertilisation of the Ovum," *apropos* of the author's researches into the development of the marine gastropod *Crepidula plana*.

Lecture iii. is by Prof. Jacques Loeb, "On some Facts and Principles of Physiological Morphology." He first considers the question of "heteromorphosis" or substitution of organs, as illustrated (under the maltreatment of *Antennularia*) by the development of new roots and apices in relation to gravitation, and by root formation at points of contact with solid bodies, in *Margeliss* and other hydroids. He shows that it is possible to obtain roots and polyps at will over various and interchangeable areas, in direct response to modified conditions of growth. There follows this a lecture by Prof. Ryder on "Dynamics in Evolution," which is suggestive but imaginary. New terms and statements of probabilities it does contain, but new facts it does not. Its most interesting portions are those relating to surface tension in its probable bearings on protoplasmic activity; but it appears to us rather more sensational than sound. The comparison of the behaviour of a contracted smoke-ring to an amoeba in motion is suggestive, perhaps in a sense not intended by the author. Dr. Watasé follows with a dissertation "On the Nature of Cell Organisation."

Lecture vii. is a very welcome one, by Dr. Howard Ayers, on *Bdellostoma Dombeyi*, *apropos* of its author's work upon the comparative morphology and physiology of the vertebrate ear. He deals at some length with the habits of the animal, and adduces additional evidence for the belief in the primitive, as distinguished from the alleged "by parasitism degenerate" nature of the cyclostomi which has been so generally accepted. He records the fact that the gills vary in number from eleven to thirteen on either side, in individuals from different localities; he regards this variation as indicative of suppression, and the numerically highest as the most primitive type, instituting comparisons with the larval *Amphioxus* which appear to us unsound. We welcome his conclusion that the numerical variation of the gills has nothing to do with the formation of the ductors oesophago-cutaneous. He provisionally argues that *Bdellostoma* is unique in the fact that geographical distribution has had little or no effect upon its anatomical structure; and proposes to recognise but a single genus and species of this form, in a manner curiously mindful of his notorious attempt to similarly unite *Protopterus* and *Lepidosiren*. Not even allowing for the possibility that the hitherto accepted species of *Bdellostomas* may be distinct in their habits as well as taxonomically, this proposal appears to us premature, and systematic ichthyologists will certainly not acquiesce to it. In common with most subsequent investigators, he finds himself unable to confirm Beard's alleged discovery of calcified teeth in these creatures. He regards Beard's "bone" as "much hardened horn, produced by the methods used in preparation." This we cannot accept. The cells of Beard's "calcified teeth," although uncalcified, are mesoblastic, and the structure described by him as an "enamel cap" (whatever it may be) certainly does appear in individual sections. He finds that hermaphrodites occur even among old individuals; but while examples possessed of ripe ova and spermatozoa may be forthcoming, he finds them to be rare, and concludes that preponderance of males is the ordinary condition. His observations upon the olfactory organ

<sup>1</sup> "Biological Lectures delivered at the Marine Biological Laboratory of Wood's Holl." Vol. ii. (Boston: Ginn and Co., 1894)

have led him to the belief in the paired nature of the cyclostome nose, but they are curiously at variance with those of Von Kupffer that have lately led to the opposite conclusion. His remarks upon the functions of the thread-forming type of cutaneous gland are particularly welcome, in correlation with Weymouth Reid's work upon the origin and constitution of the thread substance. Concerning the ear, he records the striking result that while removal of one labyrinth leads to marked disturbances in the equilibrative function, on the removal of both ears all trace of such disturbance disappears. Morphologists and physiologists will await with interest the full edition of this important communication.

Lectures viii. and ix. are botanical, and as unequal in merit as any two in the whole work. One of them, by Prof. Muirhead Macfarlane, on "Irrito-contractility in Plants," is a record of some beautiful and striking experiments, a very charming one being that with a block of ice, from which he has drawn the conclusion that displacement of the *Oxalis* leaf under its action is the effect of cold and not of weight. The author reverts to his earlier observation, no less beautiful and striking, that in order to induce the closure of the *Dionaea* leaf the application of two successive stimuli within proper intervals is necessary. He deduces two leading principles—(1) that plants, like animals, being in a condition of protoplasmic continuity, are, by virtue of it, possessed of a power of general contractility; and (2) that the positions taken up by the *Oxalis* and other leaves under the action of the tropical sun are due to heat and not light effects. The other lecture, by Prof. W. P. Wilson, on "The Influence of External Conditions on Plant Life," contains little new, and is in part vague and unintelligible.

The volume closes with an illustrated report on "The Marine Biological Stations of Europe," by Dr. Bashford Dean, and an appendix on "The Work and the Aims of the Marine Biological Laboratory" at Wood's Holl, by Prof. Whitman, giving a list of close upon 100 papers produced under its auspices.

It cannot have escaped the reader's notice that the contents of the book are largely reports upon experimental work which bears directly upon the recent theories of Weismann, so popular in our own land. Contemporaneously with the labours of Wilson and Loeb, of which an account is given in its pages, the work of Driesch, Herbst, and others, which carries us back through that of Vejdovsky, Chun, and Chabry, to the classical observation of Haeckel, now twenty-five years old, that detached portions of the fully segmented ovum (of the Siphonophoran *Crystallodes*) may give rise to young animals, have materially modified our conception of certain fundamentals of embryology. The observation that variation in development, "twinning," and other kindred phenomena, may bear a definite relationship to variation in temperature, chemical composition, and osmotic pressure of the surrounding medium, is now well established. The discovery that after the removal of either the micromeres or macromeres, the segmenting embryonic mass may still form a gastrula—that the differentiation of outer layer cells to form certain larval organs may be directly a question of location—and that certain blastomeres if separated at the two-celled stage may each give rise to an embryo one-half size, and if isolated at the four-celled stage to one of one-fourth size, is very extraordinary; and, viewing the situation generally, one is prone to ask where now are the said theories? Concerning them, Prof. Wilson replies "the fine spun thread . . . leads us little by little into an unknown region, so remote from the *terra firma* of observed fact that verification and disproof are alike impossible." The theories of Weismann were originally framed with the laudable desire of stimulating inquiry. They do not seek to explain the

actual *modus operandi* of the hereditary process so much as to localise the seat of hereditary tendency and influence. The implication that neither proof nor disproof are possible, applies, for the matter of that, to even the theory of descent with modification *versus* that of special creation. The educated mind has, however, upon purely logical grounds, chosen between the alternatives in this instance, and it may be safely relied upon to do so in the other.

G. B. H.

## NOTES.

THE anniversary meeting of the Royal Society will be held on Friday, November 30.

AT the first monthly meeting of the Royal Statistical Society for the present session, held on Tuesday afternoon, a gold Guy Medal was presented to Dr. Robert Giffen, C.B., F.R.S., in recognition of his long and exceptional services to statistical science.

M. LOUIS FIGUIER, who died on November 8, was an eminent populariser of the results of scientific research. He was born at Montpellier in 1819, where he took his degree of Doctor of Medicine in 1841. A few years later he became Professor of Pharmacy in the Paris École de Pharmacie. In 1850 he took his degree as Doctor of Science at Toulouse. He published some important memoirs on chemical subjects, but will be remembered chiefly for his numerous works on popular science. Since 1856, he issued every year the *Année Scientifique*, in which he summarised the most interesting and important scientific discoveries of the year.

THE Manchester correspondent of the *Lancet* says that the sum of £783 10s. 3d. has been raised for the fund in memory of the late Prof. Milnes Marshall, and after expenses £760 2s. 3d. will be left. Of this sum £650 have been invested in Manchester Corporation Stock to provide for the maintenance of the Marshall Biological Library given to the Owens College by the relatives of Prof. Marshall, while £102 8s. 6d. have been similarly invested to provide a "Marshall Gold Medal" to be annually competed for at the Owens College athletic sports.

DR. J. SCHEINER, of the Potsdam Astro-Physical Observatory, has been appointed Extraordinary Professor in Berlin University.

A SEVERE earthquake occurred on Friday last in Sicily and Southern Italy. The shocks were felt not only in the city and district of Messina, and several other places in Sicily, but also throughout the province of Reggio di Calabria, in Southern Italy. The disturbance was also recorded upon the seismic instruments at Rome and Ischia. Shocks of more or less violence were felt at Palmi, Seminara, Santa Eufemia, and San Procopio, in the province of Reggio di Calabria. The centre of the disturbance in this province appears to have been in the west, round the towns of Palmi and Bagnara. San Procopio, a town near Palmi, has been almost entirely destroyed, and it is estimated that at least two hundred persons have perished at that place alone. Since Friday the district of Reggio di Calabria has been slightly disturbed, but these tremors have not caused any further damage.

THE Drapers' Company have contributed £20 to the funds of the Epping Forest Museum, now being formed in Queen Elizabeth's Lodge, Chingford, by the Essex Field Club, under the sanction of the Epping Forest Committee of the Corporation of London. The museum is intended to illustrate the natural history, antiquities, and scenery of this beautiful district.

THE *Weekly Weather Report* of the 17th instant shows that in many districts the rainfall greatly exceeded the mean; over all the southern counties of England the amount was nearly four times as much as the average. The largest amounts recorded at