

same Deinosaurian class, although "its fore limbs are more crocodilian," and "its pelvic girdle more lacertian." And the evidence offered by the articular ends of the bones of the extremities being adapted for movement in particular directions, the possession of large claws, and the hollowness of the long bones, indicate that it was of terrestrial, and not, as its name seems to imply, of marine habit. It may, however, have been, as Prof. Phillips suggests, "a marsh-loving or river-side animal." Its gigantic size may be gathered from the fact that one of the femora measures no less than 64, and a humerus 51.5 inches (Fig. 4).

Nor is there evidence wanting as to its diet. From the mutilated fragment of a tooth in the Oxford Museum, Prof. Phillips infers that its possessor lived on vegetables, since it resembled "that of an iguanodon in general shape (as far as can be known, one edge being broken), with a similar sweep of the concave surface seen in the diagram, and corresponding alternation towards the edge. The edge is not serrated, but the striæ of accretion are so arranged as to suggest that it may have been." The truth of this conclusion is proved by the subsequent discovery of a nearly perfect crown by Mr. Burrows, one of my students, in the Enslow Quarry, which has very much the appearance of a young tooth. It presents the serrations which have been worn away in the specimen above described, and bears out completely Prof. Phillips's description.

I have chosen merely these two animals as illustrating the subject-matter of the book, which is in every sense worthy of the high reputation of its author. W. B. D.

#### PARTHENOGENESIS AMONG THE LEPIDOPTERA

THE part of the *Archives Néerlandaises*, published by the Société Hollandaise des Sciences à Harlem, for 1870, contains the results of some very interesting experiments undertaken by M. H. Weijenbergh, jun., on the above subject, one fraught with considerable interest to others besides entomologists. By Parthenogenesis is meant the power that is possessed by females of producing eggs endowed with vitality, and from which young ones are produced, without impregnation taking place on each occasion. This subject has been extensively treated by von Siebold in his "Wahre Parthenogenesis bei der Schmetterlinge und Bienen," Leipzig, 1856, but confirmatory and new investigations were much needed. Those of M. Weijenbergh were conducted with every possible care and precaution, so that they can be relied upon. In the autumn of 1866 he saw a male and female of the species *Liparis dispar* together, and some days afterwards he saw in the same place a great quantity of the eggs, about 500 in number. In order to leave the rearing of these to natural processes, as far as possible, he left them exposed all the winter in the open air, and in April 1867, he removed them into his house. Before the end of the month the caterpillars had successively made their appearance. These were regularly fed, and by the middle of July each of the chrysalides which had been formed during June gave birth to a perfect butterfly. It was easy, with a little practice, to distinguish the sexes whilst in the caterpillar state, and all the males were removed as far as possible, and the females were placed in a box closed to all access from without. So successfully was this separation of the sexes effected, that only one male butterfly made its appearance among the females; and, as these had been successively removed to a third closed box as soon as they escaped from the chrysalis state, it was only necessary to sacrifice the three or four females which were in the box at the time. In all, about sixty females were obtained, to which there was absolute certainty that no male could by any possible chance have had access. Of

these, two-thirds laid eggs in the autumn,—some, one, two, or three eggs only; others as many as ten or twenty, but yet even at the most not one-twentieth of the eggs of their mother. The other one-third laid no eggs at all. In all about 400 eggs were collected, which were removed and carefully packed up till April 1868, when a large number of little caterpillars were seen. These were immediately placed on leaves in a large glass vase and watched carefully. It was easily to be seen that this batch of caterpillars possessed far less vitality than those of the previous year. A large number of the eggs dried up and were worthless, some fifty caterpillars alone appearing, and of these only about forty survived to become chrysalides. From these, by the end of July, twenty-seven butterflies made their appearance. The same precautions having been taken as before, the number of females was found to be fourteen. Of these, when again there had been no possibility of male access, one half laid no eggs, the remaining half, however, laying in all a fair number. As in previous years, these were removed and left all the winter carefully packed up, till, in April 1869, three years after the commencement of the experiments, young caterpillars again made their appearance. From these, strange to say, the number of butterflies obtained was in excess of those obtained in the previous year. The number of females as compared with males, was almost the same, in contradiction to the results of other investigators, which had indicated the probability of the ratio of the males to the females greatly increasing with each additional year. The eggs laid by the females of this year, carefully isolated as before, were packed up during the winter, but when examined in the spring of last year, 1870, no caterpillars made their appearance, the eggs became shrivelled up, and the experiment was at an end. There is every reason to believe that it was most carefully conducted, and that every regard was paid to strict accuracy during the whole three years or more that the experiment was being carried on. The results amount to these:—

- (1.) Aug. 1866, eggs laid by impregnated female; April 1867, caterpillars appear; and, in July, perfect butterflies.
- (2.) Aug. 1867, eggs laid by females of this year without impregnation; April 1868, caterpillars appear, and, in July, perfect butterflies.
- (3.) Aug. 1868, eggs laid by females of this year without impregnation; April 1869, caterpillars appear, and, in July, perfect butterflies.
- (4.) Aug. 1869, eggs laid by females of this year without impregnation; April 1870, no results—the eggs all dried up.

Thus, after the first impregnation of the female in the autumn of 1866, three successive broods of caterpillars and, ultimately, of butterflies made their appearance; and four successive times were eggs laid without further impregnation, in three of which they proved endowed with vitality. It would take a long series of experiments, each conducted with the same care as this, before an average could be drawn to determine the limit of this strange reproductive power. These experiments are so easily performed, and yet so valuable when accurately made, that a wide field is opened to those who do not care to undertake long and elaborate scientific investigations, and to such we most cordially commend them. Their value, as bearing on the theories of spontaneous generation, is very great, as there is much apparent probability that this power of Parthenogenesis will increase as we descend in the scale of life just as it decreases as we ascend. By its aid many phenomena, now apparently very strange and perplexing, will be found to be but obeying one great and universal law of nature, which becomes less visible the higher we ascend in the scale of life, but yet never ceases.

In conclusion, it may be stated that this power of Parthenogenesis has been found in many species of butterflies, and also among bees; and M. Weijenbergh, at the

end of his interesting paper, gives a list of the seventeen or eighteen species which are known to him, or which are recorded as possessing this power. It is extremely probable that the more the subject is investigated, the more commonly will it be found to exist.

J. P. E.

#### RESULTS OF SANITARY IMPROVEMENT IN CALCUTTA

WHEN a great public work is being done, it is a duty to call attention to it. In March 1862, Prof. Longmore, of Netley, who had acted as Sanitary Officer during the Mutiny at Calcutta, gave the following evidence before the Royal Commission on the sanitary state of the Indian Army:—"As regards the chief part of this extensive city (Calcutta)—that inhabited by the native population—the pestilential condition of the surface-drains and yards, and many of the tanks among the huts and houses, would not be credited by any one who had not been among them." In the "Report on Sanitary Improvements in India up to June 1871," recently printed by the India Office, is given a table showing that the cholera mortality in Calcutta had, for twenty years preceding 1861, averaged nearly 5,000 deaths per annum. In 1860 the cholera deaths were 6,553, and in 1866 they were 6,823. About this latter date works of drainage and water supply were commenced and have been gradually extended. Water is taken from the Hooghly and thoroughly filtered—it is then conveyed in pipes  $12\frac{3}{4}$  miles in length to a reservoir in Calcutta and thence distributed. The whole population had this benefit conferred on them in the beginning of 1870, from which date the use of foul tank and river water was discontinued.

The drainage works are as yet confined to the southern districts, the sewage from which is conveyed to an outfall at the Salt Lake, and will be passed over a square mile of reclaimed land there, for irrigation of crops. The mortality from cholera in 1870 was 1,563, and the general mortality has fallen year by year with the extension of the works. Last year (1870) the death-rate was  $23\frac{1}{4}$  per 1,000, considerably less than half what it was in 1865.

At a Social Science meeting held in Calcutta last March, a native physician, Dr. Chuckerbutty, gave his experience of the sanitary results as follows:—"I am in the habit of visiting, in the pursuit of my profession, the houses of the rich, as well as of the poor, in both divisions of the town, and I frankly confess that in the southern division, wherever the drainage works have been brought into play, the dwellings even of the humblest cottagers are in an infinitely better sanitary state than the mansions of the richest millionaires in the northern division where the drainage operations have not been extended. Before the completion of the water-works and the partial operation of the new drainage works, the mortality in Calcutta from dysentery, cholera, and fever, was most appalling. In 1865 dysentery was so common and fatal that sloughing cases of it were of daily occurrence. Such cases are now rarely to be seen. My annual share of cases of cholera in the Medical College Hospital before the completion of the new water-works was about 700, and I declare to you that, during the last eight months, I have scarcely had a dozen cases of that disease. Fever, too, has decreased during the same period in a like manner." The actual deaths from cholera in April, May, and June, of the present year were 85, 29, and 26, respectively.

After such results as these, we need not feel surprised that the Justices of Calcutta, a large proportion of whom are enlightened native gentlemen, decided unanimously last August to extend the drainage works all over the city, notwithstanding the opposition on purely theoretical grounds of certain British medical officers who ought to have known better, to the use of ordinary house drainage for Indian houses.

The opinion of the Army Sanitary Commission on this

subject is quoted as follows in the India Office report:—"The municipal authorities of Calcutta and their officers have set an example of enlightened administration and effective expenditure to other Indian municipalities, which it is hoped will be followed. There are indeed few cities anywhere which can show so much good work done in so short a time and with such promising results for the future."

The laws of nature are the same everywhere. Calcutta has in times past suffered as London used to do from fatal fevers and bowel diseases, and there is now every prospect that a few years of active work will remove this stigma from the capital of the East, as it has been removed from the metropolis of the British Empire.

#### NOTES

THE following telegrams respecting the Total Eclipse of Dec. 12 have been received since our last:—"From the Governor of Ceylon to the Earl of Kimberley, dated, Colombo, Dec. 12, 10.45 A.M.:—"A telegram from Jaffna states that splendid weather prevailed during the eclipse. Most satisfactory and interesting observations have been made." "Mangalore, Dec. 16.—The eclipse observations have been very successful. The extension of the corona above hydrogen apparently small. Five admirable photographs have been taken." From Mr. Davis, photographer to the English Eclipse Expedition, through Lord Lindsay:—"Mangalore, Baikul.—Five totality negatives; extensive corona; persistent rifts; slight external changes." The French Academy of Sciences has received from M. Janssen the following telegraphic despatch, dated Octacamund, December 12, 5h. 20m.:—"Spectre de la Couronne attestant matière plus loin qu'atmosphère du Soleil."

WE can hardly credit the report which has just reached us that the Treasury has, at the last moment, declined to sanction the expenditure of public money on the publication of the Eclipse Reports of 1860 and 1870. We understand the combined report is now nearly ready, and both Parliament and the nation are entitled to receive a statement of the manner in which the public money has been expended. There are innumerable cases which may be cited as precedents for the publication of similar documents by the Government; as, for example, the Survey of Sinai, and the annual Greenwich Reports of Observations. After the Government has so generously granted money for recent scientific observations, we can hardly believe that the spirit of parsimony will so far prevail at the last moment as to mar, in this manner, the services it has performed towards Science.

THE death is announced on October 10, in Nicaragua, of fever, of Dr. Berthold Seemann, one of our most enterprising travellers and naturalists. Born at Hanover in 1825, Dr. Seemann was, in 1846, appointed naturalist to H.M.S. *Herald*, in its survey of the Pacific, during which voyage he had the opportunity of exploring, more thoroughly than almost any other European, the Pacific countries of South America and the Isthmus of Panama. In the same vessel he subsequently visited the Arctic regions, and the "Narrative of the Voyage of H.M.S. *Herald*," by Sir John Richardson and Dr. Seemann, is an important contribution to the natural history of previously little-known regions, the portion contributed by the latter comprising an account of the flora of Western Eskimo-land, north-western Mexico, the Isthmus of Panama, and the island of Hong-Kong. In 1860 he was sent by the English Government to the Fiji Islands, then lately acquired, and on his return published two works, one containing a narrative of his mission, the other, under the title of "Flora Vitiensis," a history of the vegetable productions of the islands. Since 1864, he has been greatly interested in the mining capabilities and other resources of the