

other farms; (5) next to variety, season, and then soil, most affect the composition of swedes; the influence of manuring is not marked. The fourth conclusion is warranted by the facts which Mr. Collins brings forward, but this point is one on which further information is wanted, for it seems probable that the relative position of different varieties might change if the varieties were exposed to markedly different conditions.

A *Bulletin* recently issued by the U.S. Department of Agriculture, entitled "The Mango in Porto Rico," discusses the prospects of mango cultivation on the island. Porto Rico grows mangoes in abundance; the climate is very favourable, and the trees are free from disease, but hitherto seedling trees only have been grown, and one is not surprised to read that the mangoes have met with but little favour in the American markets. The fame of the Bombay mango is due to the fruit of grafted trees, and it is rarely that trees raised from seed produce fruit worth eating. Seedling trees abound in every village, but first-rate trees are very uncommon. The short list given in Woodrow's "Gardening for India" shows how rare really good seedlings are. When the Americans import fine strains and take to growing grafted mango trees the industry is certain to make rapid progress. We gather from the *Bulletin* that this subject is likely to engage the attention of the local experiment station. We hope it may, for if the matter is taken up with the energy characteristic of the American stations, there is every prospect of a great increase in the supply of the finest of tropical fruits.

#### REPORT OF THE MALARIA EXPEDITION TO THE GAMBIA.

THE Liverpool School of Tropical Medicine has just issued a most important and practical report upon the prevention of malaria in the tropics.<sup>1</sup> Dr. Dutton, who conducted the expedition with conspicuous success, shows with striking clearness how a great deal of disease is due to the want of knowledge of the nature of malaria, and that during the dry season the residents are largely to blame for the appearance of the disease. It is one of the most hopeful reports ever issued by the school, and it shows that the governors and others in authority upon the coast are fully alive to the importance of stamping out malarial diseases. The report is an immense step forward in preventive medicine.

The object of the expedition was to investigate the conditions under which mosquitoes were propagated in the town of Bathurst and at the principal stations of the colony, and to suggest methods of destroying these insects. Malaria was found to be prevalent in the colony; 80 per cent. of the native children examined harboured malaria parasites in their blood. The liability to infection of the Europeans commences soon after the rains are established, lasting up to the end of November. The various breeding places of mosquitoes are described in detail in chapter iv. of the report, particular mention being made of the wells, canoes, boats, lighters, cutters on the foreshore, and of the grass-clogged trenches in many of the streets, which together supply Bathurst with the majority of its mosquitoes during the wet season and for part of the dry season. The number of mosquito breeding places present in compounds was found to vary with the social position of the occupier. They increased in extent and number in proportion to the wealth and position of the occupier.

An account of the examination of one of the large compounds illustrates to what extent mosquitoes are bred by the white man in the tropics on his own premises.

In one factory yard were found six barrels, and in the garden there were seventeen tubs and eight small wells, all breeding quantities of *Culex*, *Stegomyia*, and *Anopheles* mosquitoes. Besides these dry season breeding places, discarded domestic utensils were scattered about the yard and garden which, in the wet season, would have acted as breeding places. It is pointed out that during the dry season, from November to May, natural breeding places for

<sup>1</sup> "Report of the Malaria Expedition to the Gambia, 1902, of the Liverpool School of Tropical Medicine and Medical Parasitology." By J. E. Dutton, M.B., and an appendix by F. V. Theobald, M.A. Pp. 46+xi. (Liverpool: University Press, 1903.)

mosquitoes in Bathurst cease to exist, and from this period the people breed mosquitoes solely in their own compounds.

In chapter v., which deals with the prevention of malaria in Bathurst, a campaign against the mosquito is advocated; the town is judged especially suitable for its success. Thus Bathurst is situated on a practically isolated piece of land surrounded on nearly all sides by a broad expanse of sea water. The amount of land to be dealt with is comparatively small, viz. about a square mile. The surface is fairly level, sandy, absorbing water readily. In this area the breeding places of mosquitoes are a known quantity, the artificial, or those made by man, being in excess of the natural. The rainfall is very small, and rain occurs only during four out of the twelve months of the year.

The probability of the introduction into Bathurst of yellow fever from Senegal is pointed out as another reason for attacking the mosquito. The expedition was informed by His Excellency the acting Governor, H. M. Brandford Griffith, of the intention on the part of the Colonial Government to enter upon a crusade against the mosquito, and on November 18 the preliminary removal of rubbish from houses and compounds began; a sanitary inspector was appointed, and received special instruction in the work. Under him worked a gang of labourers, and at the time of the departure of the expedition (January 10) 363 houses and compounds had been inspected. From these 131 cartloads of old tin pots and other rubbish were removed. On the return of His Excellency the Governor, Sir George C. Denton, the inspector and a sufficient staff of labourers were appointed permanently, and a grant of 200l. per annum was given for the special anti-mosquito work. Anti-mosquito regulations have been drawn up by the Colonial Government. These are given at the end of the report.

An appendix, by Mr. F. V. Theobald, is attached to the report; in it are described the various species of mosquitoes collected by the expedition, many of which were new to science.

#### ZONES IN THE CHALK.

IN NATURE for August 8, 1901, attention was directed to the second part of Dr. A. W. Rowe's researches on the zones of the White Chalk. We have now had the satisfaction of receiving the third part of this most interesting and important work, which deals with the Chalk of Devon (*Proc. Geol. Assoc.*, vol. xviii. part i., 1903).

Working the palæontology with such aids as can be gathered from the local stratigraphy and lithology, the author, assisted as before by Mr. C. D. Sherborn, has added extensively to our knowledge of the successive forms of life that are met with in the Chalk between Sidmouth and Lyme Regis. Whether or not the limits of the zones happen to coincide with definite stratigraphical limits, these latter afford useful data, and one marl band to which the author directs special attention, forms the plane of division between the zones of *Terebratulina gracilis* and *Holaster planus*. Such definite and continuous bands of rock (so far as they can be traced) must afford even more precise evidence of contemporaneity than the presence of this or that fossil. Even a tabular flint-band has proved "an almost constant feature throughout the coast"—an interesting fact, and one that was not to be expected. It is admitted that the name-fossils are not always confined to their zones. *Holaster planus* is found by Dr. Rowe throughout the zone of *Terebratulina gracilis*. But the guide-fossils, the general assemblages associated with the name-fossils, while they exhibit here, as elsewhere, local variations, tell the same story of the successive zones or stages of life, and indicate their approximate limits. Perhaps too much importance is given to the effort to fix a precise divisional plane between zones. When such divisions depend on the forms of life, and the succession of life is continuous though gradually varying, there can be no absolute planes of division, except through the absence or erosion of strata belonging to a particular period of time.

The work before us is rich in its stores of interesting facts. The zone of *Rhynchonella Cuvieri* presents noteworthy features in the presence of *Micraster cor-bovis* and *M. leskei*, the zone of *Terebratulina gracilis* is "singularly rich in fossils," while in the zones of *Holaster planus* and

*Micraster cor-testudinarium* the group-form of *Micraster* is almost wholly absent. Nor are the lithological deviations less noteworthy, for the particular characters of the Chalk vary at different stages, and the same division may be nodular or smooth, and have many or no belts of flints. The value of a detailed palæontological study of our strata is abundantly manifested in this essay, and not the least interesting part of it is in the light it throws on the geographical as well as geological distribution of the fossils.

A most excellent series of plates of cliff-sections, from photographs taken by Prof. H. E. Armstrong, accompany this work. H. B. W.

#### THE PHYSIOLOGY OF BREEDING.<sup>1</sup>

IT is a remarkable fact that the system of organs in the animal body to which they are themselves indebted for their existence is very largely neglected by physiologists; that a number of secretory, vascular and nervous phenomena intimately concerned with fertility, with the power of conception and the ability to bear young are neither understood nor investigated; and that a wide field of research as to the influences of various kinds of food supplied to the mother both on her capacity for breeding and on the growth, constitution, and variation of the embryo is as yet untouched. As a contribution to the subject of "breeding," therefore, this paper is specially welcome, and the author is to be congratulated both upon the careful work he has done and the treatment he has accorded the subject.

The wide variations in the power of breeding which different breeds of sheep and different individuals of the same breed are subject to is shown, and the effect of altitude, climate and food referred to.

The histological changes which take place in the uterus of the sheep during the œstrous cycle are carefully described and figured, and the homology of these changes with those elsewhere described for the bitch and monkey clearly established. A brief *résumé* of the author's work on the same phenomena in the ferret is given, and their essential similarity with that of the bitch shown.

Suggestive information follows on the question of ovulation in sheep and other mammals, on the stimulus necessary to bring about that process under various conditions, on the artificial methods adopted by some flock masters to stimulate breeding in their ewes, and on the effect of these methods on fertility. Here a subject is touched upon which is of vital importance to breeders, and one which requires and deserves careful study. Atresia among the follicles of the sheep's ovary is then studied, and its relation to the proportion of twins and to barrenness examined.

The remainder of the paper is occupied with a description of the formation of the corpus luteum of the sheep and an examination of the views of the most recent writers on that subject. The lutein cells are stated to be the much hypertrophied epithelial cells of the undischarged follicle, while the connective tissue element is supplied by ingrowth from both theca interna and externa.

Finally, the relation between the development of the corpus luteum and the changes which take place in the uterus during pregnancy is touched upon, and the view expressed that, while the functions of ovulation and œstrus do not represent cause and effect, they are primarily connected, inasmuch as each is dependent largely upon the same cause.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE new prospectus of the department of dyeing and tinctorial chemistry of the Yorkshire College, Leeds, shows that special facilities are provided for the study of the chemistry of the colouring matters and for research work upon coal tar products. An effort is being made to combine the standard of scientific teaching of a university with the practical training of a technical school, and to encourage the prosecution of original investigation in what is certainly the most scientific, yet unfortunately, in this country, the

<sup>1</sup> "The Œstrous Cycle and the Formation of the Corpus luteum in the Sheep." By Francis H. A. Marshall. (*Phil. Trans.*, vol. cxcvi., 1903.)

least studied branch of applied chemistry. The dyeing department was built, equipped, and endowed by the Clothworkers' Company, and is provided with lecture-rooms, pattern and diagram rooms, museums, experimental and practical dye-houses, as well as with adequate provision for research work.

THE Great Western Railway Company now offer facilities, in conjunction with the Swindon Education Committee, to their apprentices to enable them to gain technical scientific knowledge. A limited number of selected students may attend day classes at the Technical School. They must have spent at least one year in the factory, and must have regularly attended for at least one session in the preparatory group of evening classes at the Technical School. The number of studentships will be limited to thirty at any one time. For each year's course there will be a competitive examination, successful students passing on from one year's course to the next. The course of study for each year will consist of practical mathematics, practical mechanics, geometrical and machine drawing, heat, electricity, and chemistry. Those attending the classes will have their wages paid as if at work in the factory, and the Great Western Railway Company will pay their school fees. The students attending the day classes will be expected to give some time each evening to private study. Students who distinguish themselves will be allowed to spend part of their last year in the drawing office and chemical laboratory. The whole of the arrangements will at all times be under the direction of the chief mechanical engineer.

THE report on the secondary and higher education of the City of Sheffield, prepared by Prof. Michael E. Sadler, has been published in pamphlet form by the Education Committee of Sheffield. The schools and colleges now in existence in Sheffield are described and their work passed in review. A series of recommendations is then made with a view to equip the city with a complete educational system. Prof. Sadler says that the weakest spot in the educational arrangements of Sheffield is in the secondary education provided for boys. A promising boy ought to have the best educational opportunities within his reach, but at present the equipment of such higher education in Sheffield is very much behind the standard in the progressive cities of Germany and the United States. Dr. Sadler also recommends a development of the work of the Technical College. He remarks, "the work of the Technical College, admirable as it is, would greatly gain in force and depth if it were supported by a strong department of pure science." As the report rightly insists, what is wanted is that a workman should be able to deal with new problems, and in order to do this he must have, as a foundation for his technological skill, a thorough knowledge of the pure science which it is his task to apply to practical problems. The probable additional net annual cost to Sheffield of carrying out Prof. Sadler's chief recommendations is estimated at about 8500*l.*, which would mean a rate of less than three halfpence. It now remains for the Education Committee of Sheffield to put into practice some of the excellent suggestions in the report.

THE volume of "General Reports on Higher Education for 1902," just published by the Board of Education, contains with other information of importance an account of the secondary schools, science classes, art classes, and evening schools of the southern and eastern divisions of England, the former by Mr. Buckmaster and the latter by Dr. Hoffert. Speaking of the evening schools in London, Mr. Buckmaster says "the impression formed in early visits has not been removed on more complete acquaintance, and the School Board, in its laudable anxiety to throw the educational net as wide as possible, has secured quantity at the expense of quality. As missionary agencies the schools abundantly justify their existence, they bring the opportunities for improvement near to all in all parts of the metropolis, but as centres for real solid work they are not so successful, in spite of the best efforts of the teachers, the majority of whom are most enthusiastic and devoted to their work." Several methods for the improvement of these schools are suggested, such as the alteration of the rule that, where the average attendance falls below 25 per teacher, a reduction in the number of teachers should be made; that