

and by mutual pressure produce a distortion of the normally circular base. There can be no doubt that in this coral, as in others investigated by Dr. Duerden, these clusters of larvæ become organically connected, and form aggregated colonies.

In dealing with the later stages of the development, the author discusses many questions of great interest to those who have made a special study of the anatomy of corals. We may refer especially to the light thrown upon the vexed question of "theca" and "epitheca," to the demonstration that the primary ectosepta do not become entosepta as they were supposed to do in some other corals, and to the valuable suggestion as to the scientific method of writing the septal formulæ of corals. These and other matters, which are fully discussed, render the memoir of greater value than a mere record of facts and observations of the natural history of a single species of coral would be. There is a great deal to be said in favour of the old type system, the system of presenting to the reader a plain, unvarnished tale of the natural history of a species and leaving him to draw his own conclusions; but the dangers of the system may be clearly recognised

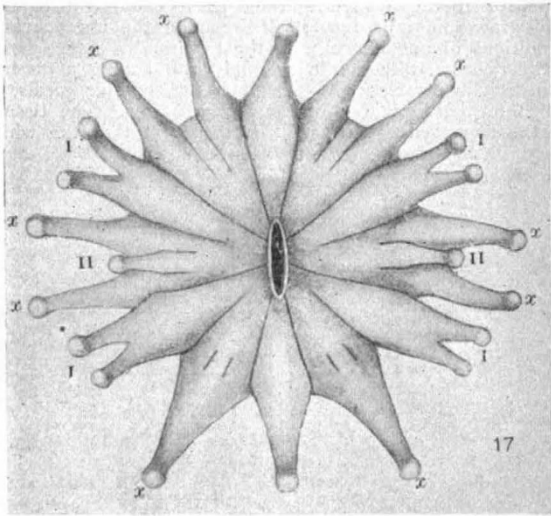


FIG. 2.—The disc of a young Zooid of *Siderastræa* with expanded tentacles showing (I.I.) the four bifurcate tentacles of the inner row.

in this memoir. The coral under review is a common, and many might think a common-place, coral, and if the author had thought fit to limit himself to a description of facts only, it would probably have been chosen as a type of its order by writers of the conventional text-book. Fortunately, however, we are warned on almost every page that *Siderastræa* is not a type, but in many respects an exceptional and rather archaic form.

In conclusion, a word of praise must be said for the manner in which the memoir is presented to the public. Like the other scientific treatises that have been recently published by the Carnegie Institution at Washington, the paper, printing, and illustrations are all of first-rate quality.

S. J. H.

GAS CALORIMETRY.

IN the recent report of the Departmental Committee appointed to consider the question of the control of the gas supply of the metropolis, a proposal was made that the calorific power of the gas should be regularly determined, thus recognising the growing importance of the heating value of gas as distinguished from its illuminating power. The use of gaseous fuel both for heating and power purposes having led to a demand for exact gas calorimetry, several types of calorimeter have come into use. In those of the Junker type, the gas is burned at a

measured rate, and the products of combustion are cooled down by a stream of water also flowing at a known rate, the ingoing and outgoing temperatures of which can be accurately measured. In spite of the difficulties of securing accurate measurements of the rate of flow of gas and water, on account of the speed with which consecutive determinations can be carried out instruments of this type are mostly used by gas engineers. Their chief defect is want of portability, and as an alternative a sample of the gas is frequently analysed, and the calorific value deduced from the results of the analysis. Apart from the difficulty of exactly determining the constituents of such a complicated mixture as coal gas, this method implies that the exact calorific value of each substance present is accurately known, and this, unfortunately, is far from being the case.

Most of the data regarding heats of combustion in actual use are derived either from the experiments of Berthelot and his pupils with the calorimetric bomb, or from the experiments of Julius Thomsen, and in the case of gaseous substances the differences between these two experimenters may amount to as much as 2 per cent. In the current number of the *Zeitschrift für physikalische Chemie* Julius Thomsen has a critical paper on the causes of these differences, and comes to the conclusion that for gases the explosion with compressed oxygen in a bomb gives quite untrustworthy results. His chief argument is based on the comparison of the values obtained for the heats of combustion of homologous series of hydrocarbons and their halogen derivatives, and it is shown that whereas the method of combustion at ordinary atmospheric pressure gives remarkably constant differences between the consecutive members of such a series, the results obtained by means of the calorimetric bomb lead to differences between consecutive members which are quite irregular. It follows that the values obtained for heats of formation, which lie at the basis of all theoretical speculations in this field, are still more irregular in the case of figures obtained with the bomb, since they are based on the differences between the heats of combustion. The weak point in most physical work on gases is usually on the chemical side, and on account of the extreme practical and theoretical importance of the subject and the great advances made in the last ten years in the methods of preparation of pure gases, there is still room for a re-determination of these constants. In this connection it may be pointed out that the ultimate mode of calibration of gas calorimeters of the Junker type is the combustion of a known quantity of a pure gas the heat of combustion of which is taken as known.

G. N. H.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The following is the text of the speech delivered by Prof. Love in presenting Prof. E. Ray Lankester for the degree of D.Sc. *honoris causa* on June 13:—

Salutat Academia nostra Edwinum Ray Lankester, alumnus suum. Hic ille est, cuius magna apud nos est memoria Anatomiae Comparativae cathedram olim tenentis, quod et discipulis ardorem suum miro modo inspirare potuit, et specimina in usum Musæi nostri diligentissime congesta ita novis rationibus collocavit ut Historiæ Naturalis principia luce clariore illustraret; qui hanc Academiam ut suos mores emendaret toties hortatus est, quæ ad inauditam perfectionem iam dudum pervenisset si monitori amicissimo in Actis Diurnis contionanti obtemperare voluisset. Hic est cuius ex repertis laudis aliquid ad suam Almam Matrem redundavit, cum inter insignissimos doctores qui hodie de animalium figuris disputant fere princeps sit et in omnibus virorum doctorum societatibus summo in honore habeatur.

Nihil profecto quod ad Anatomiam Comparativam pertinet non in huius viri scientiam cadere videtur. Neque enim huic satis erat edendi curam suscipere cum Acta illa, quæ summæ auctoritatis in hoc genere apud nos sunt, labore per quinque et triginta annos iam continuato, tum luculentissimorum librorum seriem, e quibus plures iam typis impressi in manibus omnium habentur, quod onus

pergrave videri plerisque potuit: sed de omnigenum animalium figuris et mutationibus, sive in ipsa mundi iuventa sive hodie exstantium, commentarios fere innumerabiles ipse conscripsit. Nullum est animalium genus de quo aliquid non scripserit, neque quicquam scripsit nisi præclare. In hoc viro admiramur cum summi artificis patientiam nullam rem tenuiorem esse docentis quam ut scientia dignum sit, tum doctrinam latissimam et subtilissimam nova inventa cum prioribus colligantis et suo quidque loco reponentis. Sed ulterius etiam progressus est. Quid enim? Incrementum fit scientiæ non solum ex indefessa diligentia et doctrina coacervata summorum veri indagatorum: quin ipsa diligentia et doctrina parum fertilis est nisi conclusiones ita verbis et tabulis expressæ sint ut in memoria nostra hæreant et novissimum quodque repertum suo loco residere patiantur. Veluti hic noster, qui iuvenis adhuc rationes a Ioanne Müllero et Huxleio excogitatas, quo melius omnia ad Historiam Naturalem pertinentia subtilissime litteris mandarent, se optime callere ostenderat, postea novos modos invenit, nova nomina commentatus est, veteres etiam rationes corripuit et excoluit: quæ omnia iam adeo omnibus comprobata sunt ut nemo inquirat a quo fonte emanarint. Quod si ex hac præclara supellectili unam quasi margaritam potissimum sumere fas sit, eos commentarios singulari laude ornaverim, quibus Limulum illum aquatilem scorpiones et araneas terrestres inter se similes esse ostendit. Nihil profecto in hoc genere perfectius, nihil quod posterorum imitatione sit dignius.

Following the announcement in the *University Gazette*, the age limits in the examination to be held on August 29 for the selection of probationers for the Indian Forestry Service were stated in our note on June 8 (p. 139) to be from eighteen to twenty years on January 1, 1905; Prof. Schlich writes to point out that the correct age limits are from eighteen to twenty-one years on that date.

Dr. W. T. Brooks (Christ Church) has been appointed Litchfield clinical lecturer in medicine for two years from June.

A statute has been passed in Convocation establishing a diploma in anthropology, and providing a committee to organise the course of study in that subject, and to make regulations for the diploma examination. The committee will consist of seventeen members, including the professors of anthropology, comparative anatomy, moral and metaphysical philosophy, comparative philology, the reader in mental philosophy, the keeper of the Ashmolean Museum, and the curator of the Pitt Rivers Museum. Candidates who are not already members of the university will be admitted under the same conditions as candidates for the degrees of B.Litt. and B.Sc.

Magdalen College has announced a fellowship in chemistry, election to which will be made next October term after an examination. Further details will be published shortly.

CAMBRIDGE.—The following are the speeches delivered by the Public Orator, Dr. Sandys, on June 14, in presenting the two recipients of the degree of Doctor in Science *honoris causa*:—

CAPTAIN ROBERT FALCON SCOTT, R.N., C.V.O.

Poli australis e regione salvum sospitemque nobis redditum laetamur virum intrepidum, cui disciplina et gloria navalis ab avo velut hereditate obvenerat. Abhinc annos quinque navis magister designatus est, rerum naturæ miraculis prope polum australem explorandis destinatae. Illic, primum terræ Victoriae montes asperos conspicatus, deinde ex transverso oppositum glaciæ velut murum immensum diu prætervectus, tandem nivis aeternæ regionem quandam excelsam detexit, detectam Regis Edwardi nomine nuncupavit. Quid commemorem navem illam prope montem Erebum, prope ipsa Volcani spiracula, glaciæ solidæ in mediis molibus per biennium compressam? Quid geographiæ, geologiæ, meteorologiæ, biologiæ denique in studiis, scientiarum fines, talium virorum auxilio, feliciter propagatos? Quid itinera longa glaciæ perpetuæ inter pericula tolerata? Tot virorum fortium de duce intrepido illud primum dixerim:—omnium mortalium nemo umquam ad ipsum polum australem propius penetravit. Deinde, "numquam" sociis suis "plus laboris

imposuit quam sibi sumpsit; ipse cum fortis, tum etiam felix."

SIR FRANCIS YOUNGHUSBAND, K.C.I.E.

Hodie corona nostra suprema viro destinata est, qui matris suæ fratrem, exploratorem indefessum, olim aemulatus, omnium mortalium solus, oceani Pacifici a litore trans Asiae mediæ recessus intimos septem milia passuum milies emensus, montium formidolosorum per ambages prope inextricabiles, Indiae demum ad castra prima pervenit. Idem nuper, Britanniae legatus, cum copiis nostris fortissimis, Indiae per Alpes silvasque, post moras infinitas fortiter et prudenter devictas, per apertam portam, Tibetorum ad loca præcelsa ultra lacum illum caeruleum progressus, tandem, inter nemora late virentia, arcis summae tecta aurea conspicatus, religionis antiquissimæ sedem sacram, tot laborum, tot itinerum metam ultimam, intravit. In legatione vero illa obeunda, viri huiusce potissimum auspicio, terræ spatia immensa accuratissime explorata sunt; fluminum ingentium cursus patefacti; saeculorum denique priorum monumenta plurima aut intacta relicta aut diligenter conservata. Iuvat autem recordari regionem illam remotissimam cum exercitu nostro legatum nostrum ita peragrasse, ut nullum crudelitatis, nullum inhumanitatis vestigium reliquerit, sed benevolentiae mutuae, etiam foedere ipso potioris, fundamentum iecerit.

Mr. E. T. Whittaker, of Trinity College, has been appointed a university lecturer in mathematics.

The Home Secretary has approved the university for the purposes of the Coal Mines Regulation Act (1887) Amendment Act, 1903, in respect of its diploma in mining engineering.

The Harkness scholarship in geology and palæontology has been awarded to Mr. F. A. Potts, of Trinity Hall, and the Wiltshire prize for geology and mineralogy to Mr. A. McDonald, of Emmanuel College.

The treasurer to the Sedgwick memorial fund, which was inaugurated in the Senate House on March 25, 1873, has issued a final balance sheet. The original subscription list amounted to 11,157*l.* 1*s.* 6*d.*, and this sum increased by investment to 27,453*l.* 2*s.* 4*d.*. A thousand guineas were spent on the bronze statue of Sedgwick, and 26,125*l.* on the Sedgwick Museum; the balance was mainly expended on printing, but a small sum left over has been paid to the financial board.

DR. JAMES GOW will distribute the certificates and prizes at King's College, London, on Wednesday, July 5. The museums and laboratories of the college will be open to visitors upon this occasion.

DR. A. B. W. KENNEDY, F.R.S., will deliver the foundation oration of the Union Society of University College, London, on June 29; his subject will be "The Academic Side of Technical Training."

AMONG the honorary degrees accepted by the Senate of the University of Dublin on June 17 was the degree of Sc.D. to be conferred on Prof. E. A. Schäfer, F.R.S., and on Prof. Sydney Young, F.R.S.

MR. G. F. CARSON, formerly on the staff of the University College, Sheffield, has been appointed head of the department of mathematics in Battersea Polytechnic, and Miss Lillian J. Clarke has been appointed lecturer in botany.

AT the entrance examination for the day courses in engineering to be held next September, the governing body of the Northampton Institute, Clerkenwell, has decided to offer three scholarships for open competition. These scholarships will give exemption from fees, amounting to 5*l.*, during the whole of the four years' course in mechanical or electrical engineering.

DURING December next, in the department of physics of the Columbia University, New York City, a course of fifteen lectures will be delivered by Prof. V. F. Bjerknes, professor of mechanics and mathematical physics in the University of Stockholm. The subject will be "Fields of Force," including the discussion of hydrodynamic analogies of the electrostatic and electromagnetic fields. A similar

course will be delivered in March and April, 1906, by Prof. H. A. Lorentz, professor of physics in the University of Leyden.

UNDER the title "The Education of the Examiner," Dr. Charles E. Fawsitt publishes, in the *Proceedings of the Royal Philosophical Society of Glasgow*, an interesting note on the statistics of examination marks as revealed by graphic methods. Most examiners who have had to draw curves showing the distribution of marks in any examination know the difficulty of obtaining an even uniform curve rising continuously to a maximum and then descending continuously. However carefully the scale of marking is adjusted, the curve has an unpleasant habit of showing two maxima, usually of unequal height, instead of the one maximum of the generally recognised standard curve. Dr. Fawsitt, as the result of observations on class examinations conducted at Edinburgh, brings forward the welcome suggestion that this irregularity is not the fault of the examiner, but is due to the fact that the candidates naturally divide themselves into two sets, namely, workers and non-workers, and that while the students in either set vary in every conceivable way in respect of *ability*, a marked line of division is drawn with regard to work. The superposition of two error curves, in accordance with this theory, gives results closely agreeing with those of common experience.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 16.—"On the Dimorphism of the English Species of Nummulites, and the Size of the Megalosphere in relation to that of the Microspheric and Megalospheric Tests in this Genus." By J. J. **Lister**, F.R.S.

The results obtained in this investigation are summarised as follows:—

(1) Both microspheric and megalospheric forms of *N. variolarius* and *N. Orbigny* var. *elegans* are present in the Eocene beds of the Isle of Wight and Hampshire, as the author believes they will be found to be present elsewhere, except when the materials of a bed have been re-arranged under the influence of currents.

(2) In these species and in *N. laevigatus* and *N. gizehensis* the size of the microspherule is nearly constant—the diameters in the specimens measured being between $15\ \mu$ and $20\ \mu$.

(3) In the nine species and one variety of Nummulites which the author has examined, the size of the megalospheric form is approximately proportional to the volume of the contents of the microspheric form.

By this result additional proof is given of de la Harpe's conclusion, founded on the mode of occurrence in the beds, and on structural features of the tests of the two forms, that these are in each case truly members of "a pair," or, as we now say, are related as alternating or recurring forms in the life-history of a species.

By (2) and (3) the two modes of reproduction come into marked contrast, the asexually produced megalospheres being proportional in size to the protoplasmic volume of the parent, while the microspherule, probably arising as a zygote, is uniformly small throughout.

(4) In several of the species examined, as the microspheric member of the cycle preponderates in the life-history, the megalospheric (or gamete-producing) member decreases, not only in proportion to the size of the microspheric form, but in proportion to the megalospheric members of other species in which the two forms attain approximately equal sizes.

April 6.—"Ovulation and Degeneration of Ova in the Rabbit." By Walter **Heape**. Communicated by Adam Sedgwick, F.R.S.

This paper is an abstract of several years' experimental work. The growth of the graafian vesicle and ovum, and the modification of the adjoining ovarian tissue, are referred to. The maturation of the ovum takes place in the ovary. It is dependent upon coition, and follows a cessation of

the supply of nutriment to the ovum. Ovulation occurs ten hours after copulation, and does not occur if coition is prevented.

The cause of the rupture of the graafian vesicle is probably due to the stimulation of ovarian contractile tissue, to effect which, in the domestic rabbit, the excitement of sexual contact appears to be necessary.

The prevention of coition results in the degeneration of ripe follicles, and the production of false corpora lutea. Such degenerate follicles do not rupture, and the ovum contained therein is not discharged. The structure and fate of the true and false corpora lutea are briefly described.

The persistent prevention of breeding causes degeneration of young as well as ripe follicles on a large scale, and results in more or less obstinate sterility.

Degeneration of young follicles occurs normally. While this may be due to want of nutriment, caused by competition of neighbouring follicles, it may also be due to incapacity to assimilate the nutriment which is supplied.

In this latter case, failure is due to a peculiarity in the constitution of the ovum, constituting it a "sport." As there is evidence that the production of variable offspring depends upon the quality or quantity of nutriment supplied to the mother, it is urged that the study of nutrition from this point of view becomes a matter of very great interest and importance to students of heredity.

A brief review of the evidence concerning the forces which influence breeding results in the conclusion that changes are induced in the constitution of the blood by means of a "generative ferment" of extraneous origin; the effect of which upon the generative glands causes their secretion of "gonadin," which exercises a profound effect upon the rest of the generative system.

"On the Nature of the Silver Reaction in Animal and Vegetable Tissues." By Prof. A. B. **Macallum**.

When fresh preparations of animal and vegetable tissues are treated with a solution of nitrate of silver containing free nitric acid and then exposed to light, they become coloured, the colour varying in intensity and tint. The author endeavoured to determine to what the reaction is due, and how far one may go in employing it for microchemical purposes. It was found that of the organic constituents of tissues, the only ones which form compounds with silver "reducible" under the action of light are sulphocyanic acid, creatin, and taurin. As creatin is present only in vertebrate muscle fibre, and not at all in invertebrates, while the other compounds mentioned occur in tissues only in infinitesimal, and, therefore, in negligible, quantities, the silver reaction cannot be attributed to their presence. It was further ascertained that neither phosphates, carbonates, nor sulphates give "reducible" silver compounds in the presence of free nitric acid. There remained, among organic compounds in tissues, only the proteids, and as these have been, and are, generally held to form, with silver salts, compounds which are "reduced" in light, it was necessary to determine whether the coloured compounds so formed are "albuminates" or simply the subchloride of silver. For this purpose proteids were freed from chlorides by repeated precipitation with pure ammonium sulphate, and it was found that egg and serum albumins and globulins, as well as the gelatins, after the eighth precipitation give no colour reaction whatever with nitrate of silver under the influence of light, and that the compounds eliminated by the precipitation, and to which the silver reaction is due, are chlorides. Nucleo-proteids also were found to be reactionless. In the case of vegetable proteids the methods employed were different, but the result was the same. Silver nitrate may, consequently, be used as a microchemical reagent for determining the presence of chlorides in animal and vegetable tissues, and its use for this purpose has already furnished some important results. Amongst these may be mentioned the absolute freedom of the nucleus from chlorides, the absence of the latter from the head of the spermatozoon, and the demonstration that they alone are the cause of the silver reaction in the "cement substance" (of von Recklinghausen) as well as in ordinary cell protoplasm.