

forms must be practically domesticated for the time being to supply the material.

It may be objected, also, that in the investigation of domesticated forms sordid interests will play too prominent a part. No doubt to the true scientific man the study of zoology for its own sake, that is, for an insight into the fundamental laws of life, is a sufficient incentive and reward. Judging from the past, the study of the domestic animals in any other way than in a scientific spirit and by the scientific method will prove barren; but studied in that spirit and by that method the result has always justified the effort, and has thrown as much, if not more, light upon biological problems than an equally exact study of a wild form.

Therefore, while purely practical ends can never supply the inspiration to true scientific work, still surely no scientific man could feel anything but happiness that his work had in some ways added to the sum of human well-being. Perhaps no one has expressed so well the sympathy of a scientific man with his fellow-men as Pasteur in the preface to his work on the silkworm diseases: "Although I devoted nearly five consecutive years to the laborious experimental researches which have affected my health, I am glad that I undertook them. . . . The results which I have obtained are perhaps less brilliant than those which I might have anticipated from researches pursued in the field of pure science, but I have the satisfaction of having served my country in endeavouring, to the best of my ability, to discover a remedy for great misery. It is to the honour of a scientific man that he values discoveries which at their birth can only obtain the esteem of his equals, far above those which at once conquer the favour of the crowd by the immediate utility of their application; but in the presence of misfortune it is equally an honour to sacrifice everything in the endeavour to relieve it. Perhaps, also, I may have given young investigators the salutary example of lengthy labours bestowed upon a difficult and ungrateful subject."

In conclusion Prof. Gage summarised his address by saying: However necessary and desirable it may have been in the past that the main energy of zoologists should be employed in the description of new species and in the making of fragmentary observations upon the habits, structure and embryology of a multitude of forms, I firmly believe that necessity or even desirability has long since passed away, and that for the advancement of zoological science the work of surpassing importance confronting us is the thorough investigation of a few forms from the ovum to youth, maturity and old age. And I also firmly believe that, whenever available, the greatest good to science, and thus to mankind, will result from a selection of domesticated forms for these thorough investigations.

In the Section of Botany, Prof. Barnes discussed the chief features of plant physiology in which notable progress has been making during the last decade. The great advances in plant chemistry and physics; the progress in the investigation of causes of plant form: the widening ideas of the property of irritability; the investigation of the social relations of plants, and the minute study of cell action in spite of their diversity, have one great end in view. This is nothing less than the solution of the great problem—the fundamental problem—of plant physiology as of animal physiology, namely the constitution of living matter. Entrenched within the apparently impregnable fortress of molecular structure this secret lies hid. The attacks upon it from the direction of physical chemistry and physiological morphology, of irritability, of ecology and of cytology are the concentrating attacks of various divisions of an army upon a citadel some of whose outer defences have already been captured. The innumerable observations are devised along parallel lines of approach, and each division of the army is creeping closer and closer to the inner defences, which yet resist all attacks and hide the long-sought truth.

One outer circle of defences yet remains untaken, and until that falls it would seem that there is little hope of capturing the inner citadel. More must be known of the constitution of dead substances chemically related to the living ones. When the students of chemistry can put the physiologists into possession of the facts regarding dead proteids, the attacks will be renewed more directly, with greater vigour and greater hope of success.

It is not possible to prove to-day that life and death are only a difference in the chemical and physical behaviour of certain compounds. It is safe to say that the future is likely to justify such an assertion.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Eleven county and borough councils have arranged with the Board of Agricultural Studies to make grants for the maintenance of the new department of Agriculture established under the direction of Prof. Somerville. The first list of lectures issued by the Board includes some seventeen courses.

In the valedictory address delivered by Dr. Hill on vacating the office of Vice-Chancellor, reference was made to the fact that before the close of the academic year the contributions to the Benefaction Fund amounted to upwards of 50,000*l.*; also that a commencement has been made with the new Geological Museum. The Museum will cost about 44,000*l.*, of which sum the fund raised as a memorial to Prof. Sedgwick will supply 27,000*l.*

A TECHNICAL and mining college is to be established at Wigan at an estimated cost of 40,000*l.*

THE Rev. J. F. Cross has been appointed professor of mathematics at St. John's University, Winnipeg.

PROF. A. MCADIE has been appointed honorary lecturer on meteorology in connection with the Berkeley Astronomical Department of the University of California.

MR. THEODORE MORISON has been appointed principal of the Aligarh Mahomedan College. The new principal, who is at present in this country, has been authorised to select two new professors to take out with him.

PROF. WAGSTAFF will lecture on geometry at Gresham College from October 10 to 13, and the Rev. E. Ledger's course of lectures on astronomy at the same institution will take place from November 14 to 17.

THE degree of Doctor of Pharmacy has just been conferred by the University of Paris for the first time. The recipient is M. Lacourt, whose graduation thesis was entitled "Historical, Chemical and Bacteriological Study of the Versailles Water."

THE fifteen universities of France together have a total of 27,080 students, of whom 12,059 belong to Paris. The total expenditure is 13,859,500 francs, so that the average cost of the education of each student is 511 francs (a trifle over 20*l.*). To meet this expense the universities have revenues amounting collectively to 2,093,700 francs; legacies, donations, &c., amount to 1,511,600 francs; therefore a deficit of 10,524,200 francs (equivalent to nearly 15*l.* for each student) has each year to be made up by the State.

At the half-yearly meeting of the court of governors of Owens College, Manchester, held on Tuesday last, the following resolution was carried by a majority of two:—"That, subject to such limitations and conditions as the council may from time to time determine, and subject to the council being able to make satisfactory provision for a separate instruction in such cases as the council consider necessary, the court is of opinion that it would be desirable to admit women students to the course of study which would qualify them for medical degrees and practice."

ACCORDING to the Allahabad *Pioneer Mail*, during the past year no fewer than 11,000 candidates presented themselves for the various examinations of the Madras University, and of these slightly over 4000 were successful. The fees paid by candidates amounted to nearly Rs. 1,87,000; while sundry items, including about Rs. 10,000 interest on Government securities, swelled the income of the University to a little over two lakhs of rupees. The total expenditure for the year came up to Rs. 1,80,000, of which sum Rs. 1,38,000 were absorbed by examiners' fees. The Arts Examinations, as usual, yielded the greatest portion of the University income—the total fees realised from candidates amounted to over one and a half lakhs of rupees, while payments to examiners came up to Rs. 90,000. The Law Examinations yielded a quarter of a lakh of rupees, while the examiners fees only amounted to slightly over half this sum. The Medical and Engineering Examinations, however, are conducted at a loss; but, after balancing receipts and expenditure, the University realised a net profit during the past year of Rs. 10,000, without reckoning the Rs. 10,000 accruing as interest from Government securities.

WE learn from a memorandum that has just reached us that the number of students who attended the City and Guilds of London Institute Central Technical College last session was 245. Of these 220 were following the Diploma Course, eighty-eight attending the First Year Course, seventy-eight the second, and fifty-seven the third. Twenty-five other students were either engaged in research work or were following a special course. During the past year the council has conferred the diploma of Fellowship of the City and Guilds of London Institute upon two of the past students: Mr. W. J. Pope and Mr. A. E. Childs. Siemens Medals were awarded to Mr. F. E. Whittle and Mr. F. C. Hounsfield. Mr. T. M. Lowry and Mr. E. C. Jee, were successful in gaining the D.Sc. degree of the University of London for research work done in the Chemical Department of the College. Twelve students of the College were successful in passing the intermediate B.Sc. examination of the London University. In addition to the students admitted on the results of the Matriculation examination, several others have been admitted to special courses of instruction, and the number in the College at the commencement of the new session will be about 260. Those in special courses number 20. As built the College was intended to accommodate only 200 students. To make adequate provision for Electrical Engineering, a large portion of the basement floor in the adjoining new building of the School of Art Needlework is to be used. The suite of rooms now occupied by the Technological Examinations Department will also become available for teaching purposes, as more extensive quarters are to be found for the Examinations Department in the new building. In connection with this institution, our readers may be referred to the address delivered to the students by Sir Andrew Noble, K.C.B., F.R.S., on Tuesday last (see p. 551 of the present issue).

WHEN the history of education in rural districts comes to be written, the school of science established by the united efforts of the Countess of Warwick and Prof. Meldola, at Bigods, near Dunmow, in Essex, will be given an important place in it. The claims of science to form a part of every national system of education are becoming more and more recognised in our cities, but the forward movement has not been much felt in rural districts, hence the school at Bigods is of the nature of an experiment, and much depends upon the success attained. The curriculum followed in the school meets the requirements of modern education in a most efficient way. The school is a continuation or secondary one in which the ordinary "humanitarian" subjects are by no means neglected, but are carried to higher stages. Modern languages are included, and grammar, geography and history find their places. But the noteworthy characteristic of the school lies in the fact that students devote fifteen hours a week to science, which is not taught in the old-fashioned way, by means of books and blackboard and chalk, but by real work and by observations carried on by the pupils themselves in the laboratories and in the fields. The reasoning faculty is developed by scientific methods at the very commencement of the pupil's education at the school; and students who stay at Bigods for three or four years will have acquired knowledge which will be of the highest value in after life, whether they pass into an agricultural college or enter at once into rural or other industries. For the sake of British agriculture, it is to be hoped that parents in East Anglia will appreciate the efforts being made at Bigods to provide a system of education which will assist both individual and national progress.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, September 25.—M. Maurice Lévy in the chair.—Studies on trimethylene, by M. Berthelot. Preliminary experiments were made on the preparation of trimethylene in the pure state, free from propylene, and the gas obtained, believed to be pure, was characterised by its slow reaction with bromine. Propyl alcohol dropped upon hot zinc chloride gives propylene mixed with hydrogen and propane, but almost free from trimethylene; isopropyl alcohol behaves similarly, and the substitution of strong sulphuric acid for the zinc chloride does not result in the formation of any trimethylene.—On the Neomylon, by M. Albert Gaudry. An account of the discovery of fossil remains in a cave in Terra del Fuego by Dr. Otto Nordenskjöld, the chief being the

skin of a large animal resembling the Mylon, and which has been named Neomylon by M. Ameghino.—An account of the ceremony organised at Como to celebrate the discovery of the galvanic battery by Volta.—Observations of the sun made at the Observatory of Lyons with the 16 cm. Brunner equatorial during the first quarter of 1899, by M. J. Guillaume. The results are expressed in three tables giving the number of spots, their distribution in latitude, and the distribution in latitude of the facule.—A comparison of the times obtained for the contacts of partial eclipses of the sun by direct observation and by measurements of the lengths of common chord, by M. Ch. André.—On fixed transformation points, by M. H. Le Chatelier.—On the diurnal variation of atmospheric electricity, by M. A. B. Chauveau. From the results of observations made at the summit of the Eifel Tower, it is found that the true law of variation is given by a simple oscillation with a maximum in the day time, and a very constant minimum at 4 to 5 a.m. The more complicated curve obtained by observations in an ordinary building are probably due to the influence of water vapour.—On a particular mode of reproduction of appendices of insects in course of regeneration after artificial section, by M. Edmond Bordage.—On the lateral cephalic organs in *Glomeris*, by M. N. de Zograf.—Some phenomena of cellular disorganisation, by M. Vital Boulet. The osmotic pressure in the cells of a leaf severed from the plant and left in the same water as that in which the original plant was growing was found to regularly increase from 2.2 on the first day to over 6.0 on the twenty-second day.—On the formation of secreting canals in the seeds of certain species of *Garcinia* and *Allanblackia*, by M. Édouard Heckel.

CONTENTS.

PAGE

Berthelot's Agricultural Chemistry. By R. W. . . .	541
Our Book Shelf:—	
" Bird Life in an Arctic Spring; the Diaries of Dan Meinertzhagen and R. P. Hornby."—R. L.	542
Abbott and Key: " Progressive Lessons in Science "	543
Rauh: " De la Méthode dans la Psychologie des Sentiments."—A. E. T.	543
Lebon: " Histoire Abrégée de l'Astronomie	543
Letters to the Editor:—	
The Intake of Carbon Dioxide—a Correction.—	
Dr. Horace T. Brown, F.R.S.	544
Geological Time.—Rev. O. Fisher	544
The Terrestrial Gegenschein.—Prof. S. Newcomb	544
The Cause of Undercurrents.—Admiral S. Makaroff	544
Movement of Sea-Gulls with a Coming Change of Weather.—W. F. Sinclair	545
On the Use of the Fahrenheit Scale for Observations on Sea Temperatures.—William S. Bruce	545
Cave Shelters and the Aborigines of Tasmania.—H. Ling Roth	545
The Darjeeling Disaster.—Prof. J. Milne, F.R.S.	545
Lectures at the Royal Victoria Hall.—Dr. W. J. Russell, F.R.S.	545
Vote.—James Dallas	546
The Investigation of the Malarial Parasite	546
Mr. Percy S. Pilcher	546
Notes. (<i>Illustrated.</i>)	546
Our Astronomical Column:—	
Astronomical Occurrences in October	551
Comet E. Giacobini	551
Two New Variable Stars	551
The Melbourne Observatory	551
The Best Education for Engineers. By Sir Andrew Noble, K.C.B., F.R.S.	551
The British Association:—	
Section H.—Anthropology.—Opening Address by C. H. Read, President of the Section	554
Section I.—Physiology. (<i>Illustrated.</i>)—Opening Address by J. N. Langley, F.R.S., President of the Section	557
American Association for the Advancement of Science	562
University and Educational Intelligence	563
Societies and Academies	564