

leading rôle among the conditions to which the living world owes its existing configuration. Since his time the aspect of the problem has widely changed. We must rule out the question of the origin of neutral or useless traits. We must not confuse the evolution of adaptations with the origin of species. We must bear in mind the fact that Darwin often failed to distinguish between non-heritable fluctuations and hereditary mutations of small degree. We are now aware that many apparently new variations may be no more than recombination-products of pre-existing elements. We should, no doubt, make a larger allowance for the rôle of single "lucky accidents" in evolution than did many of the earlier evolutionists. And yet, so far as the essence of the principle is concerned, I am bound to make confession of my doubts whether any existing discussion of this problem affords more food for reflection, even to-day, than that contained in the sixth and seventh chapters of the "Origin of Species" and elsewhere in the works of Darwin.

Undeniably there is a large measure of truth in the contention that natural selection still belongs rather to the philosophy than to the science of biology. In spite of many important experimental and critical studies on the subject Darwin's conception still remains to-day in the main what it was in his own time, a theory, a logical construction, based, it is true, on a multitude of facts, yet still awaiting adequate experimental test. Simple though the principle is, its actual effect in nature is determined by conditions that are too intricate and operate through periods too great to be duplicated in the experimental laboratory. Hence it is that even after more than fifty years of Darwinism the time has not yet come for a true estimate of Darwin's proposed solution of the great problem.

But there is still another word to be said. Too often in the past the facile formulas of natural selection have been made use of to carry us lightly over the surface of unsuspected depths that would richly have repaid serious exploration. In a healthy reaction from this purblind course we have made it the mode to minimise Darwin's theory; and no doubt a great service has been rendered to our study of this problem by the critical and sceptical spirit of modern experimental science. But there is a homely German saying that impresses upon us the need of caution as we empty out the bath lest we pour out the child too. This suggests that we should take heed how we under-estimate the one really simple and intelligible explanation of organic adaptations that has thus far been placed in our hands. And in some minds—if I include my own among them let it be set down to that indiscretion at which I have hinted—the impression grows that our preoccupation with the problem as it appears at short focus may in some measure have dimmed our vision of larger outlines that must be viewed at longer range; that we may have emphasised minor difficulties at the cost of a larger truth. To such minds it will seem that the principle of natural selection, while it may not provide a master key to all the riddles of evolution, still looms up as one of the great contributions of modern science to our understanding of nature.

I have taken but a passing glance at a vast and many-sided subject. I have tried to suggest that the tide of speculation in our science has far receded; that experimental methods have taken their rightful place of importance; that we have attained to a truer perspective of past and present in our study of the problems of animal life. The destructive phase through which we have passed has thoroughly cleared the ground for the new constructive era on which we now have entered. All the signs of the times indicate

that this era will long endure. And this is of good augury for a future of productive effort, guided by the methods of physico-chemical science, impatient of merely *a priori* constructions, of academic discussions, of hypotheses that cannot be brought to the test of experimental verification. The work ahead will make exacting technical demands upon us. The pioneer days of zoology are past. The naturalist of the future must be thoroughly trained in the methods and results of chemistry and physics. He must prepare himself for a life of intensive research, of high specialisation; but in the future even more than in the past he will wander in vain amid the dry sands of special detail if the larger problems and general aims of his science be not held steadfastly in view. For these are the outstanding beacon lights of progress; and while science viewed at close range seems always to grow more complex, a wider vision shows that her signal discoveries are often singularly simple. This perhaps may help us to keep alive the spirit of the pioneers who led the advances of a simpler age; and it is full of hope for the future.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

BIRMINGHAM.—The Huxley Lecture will be delivered on January 21 by M. Emile Verhaeren (the national poet of Belgium), who has chosen as his subject "L'Esprit Belge."

LONDON.—Among the opening lectures in the Lent Term at the Bedford College for Women are several which are open free to the public without ticket. In the department of geology a series of four lectures on minerals used as gem stones will be given on Thursdays at 5.15 p.m., beginning on January 28, by Dr. A. Hutchinson and Dr. H. H. Thomas. In the botany department Mr. W. Neilson Jones will lecture on Mondays at 5 p.m., beginning on January 18, on phenomena of heredity. There will also be lectures on hygiene, mathematics, physiology, and chemistry.

A COURSE of lectures to the University of London Officers Training Corps on military subjects is being given by the members of the staff of Birkbeck College, London, on Tuesdays, at 8 p.m. The first lecture, on the economics of war, was given on January 19 by the principal of the college, Dr. G. Armitage-Smith. Forthcoming lectures on succeeding Tuesdays are as follows:—"Bacteria," Dr. H. C. I. Gwynne-Vaughan; "Some Past Fights for Freedom," Mr. L. Ricci; "Trench Making," Dr. J. W. Evans; "Report Writing," Mr. J. H. Lobban; "International Law of War on Land," Mr. G. C. Rankin; "Map Making and Map Reading," Dr. J. F. Unstead; "Range Finding," Dr. A. Griffiths; "Explosives," Dr. G. Senter; "War Clouds of Modern Europe," Mr. A. Jones; "An Ancient Drill Book," Mr. F. A. Wright. The lectures are intended primarily for cadets of the Officers Training Corps, but are open to all persons interested, without fee.

A COPY of the "General Information Number" of the Bulletin of the Armour Institute of Technology has been received from Chicago. Full particulars are given of the courses offered in mechanical, electrical, civil, chemical, and fire protection engineering, as well as those in architecture and the industrial arts. Each of these four-year courses represents a carefully balanced group system of studies, combining a thorough and broad scientific training with the elements of liberal culture, and all lead to the degree of bachelor of science.

THE president, vice-president, and council of the Royal College of Surgeons in Ireland have decided to place in the college a permanent record of the names of all the students, licentiates, and fellows of the college who are at present serving with his Majesty's Navy and Expeditionary Forces, and further to erect a suitable memorial to all such as fall in the war. The president, vice-president, and council will be glad if the relatives and friends would communicate the names of such students, licentiates, and fellows to the registrar of the college.

In an article in *Science* for December 25, Mr. John C. Burg, of North-Western University, Chicago, examines and summarises the registration statistics for November 1, 1914, of some thirty universities in the United States. The largest gains for the year in the number of students were as follows:—Columbia, 1365; California, 1109; Pittsburgh, 1069; Ohio State, 832; Wisconsin, 806; Harvard, 784; New York, 634; Minnesota, 552; Pennsylvania, 536. The eight universities with the largest total number of students are given in the article as:—Columbia, 11,294; California, 8180; Chicago, 7131; Wisconsin, 6696; Pennsylvania, 6505; Harvard, 6411; Michigan, 6319; New York University, 6142. In the scientific schools, that is, including the schools of mines, engineering, chemistry, and related subjects, Illinois takes the lead with 1406 students, followed by Cornell, 1363, Michigan, 1347, Yale, 1056, Pennsylvania, 906, Ohio State, 851, Wisconsin, 796, and California, 763.

It is announced in the issue of *Science* for January 8 that the sum of 486,000*l.* was obtained for Wellesley College in the fourteen months ended in December, 1914, according to a statement given out by the treasurer. Of this amount 86,000*l.*, including a conditional pledge of 40,000*l.* from the General Educational Board, was raised before the fire of March 17, when College Hall was burned. The remaining 400,000*l.* includes a pledge from the Rockefeller Foundation of 150,000*l.* Only three gifts of more than 2000*l.* were received since last August. One of these was a gift from Mr. Carnegie of 19,000*l.* for the enlargement of the library. From the same source we learn that the Massachusetts Institute of Technology received in gifts during the past year the sum of 80,000*l.*, besides two items wherein the institute is residuary legatee, and the amounts have not been determined. Among the gifts may be mentioned: bequest of Caroline L. W. French (outright), 20,000*l.*; (residue), 20,000*l.*; Lucius Tuttle, 10,000*l.*; and Nathaniel Thayer, 10,000*l.*

THE issue for January of the Technical Journal of the Association of Teachers in Technical Institutions contains an interesting article on the Massachusetts Institute of Technology. This article is written by Dr. Tyler, Walker professor of mathematics, and Mr. R. C. Maclaurin, president of the college. It may be noted that not only is admission to the college regulated by means of entrance examinations, but there is a continual weeding out of those students who do not display the requisite ability and application. New students are examined periodically, and if their work proves to be unsatisfactory they are required to withdraw. Some of our own colleges could copy this system, and thereby show a considerable improvement in their produce. In the same journal there is an article on laboratories for building trade students, by Mr. G. Arnall. This article suggests that the time is ripe for the institution of separate laboratories for such students, in which the testing of cements, timber, ferro-concrete, etc., could be studied practically. The scheme will probably involve considerable modification of building courses, and the author invites his colleagues in this branch of teach-

ing to submit model syllabuses of laboratory experiments.

IN Circular 885, issued on January 11, the Board of Education states that there is likely to be some difficulty in procuring in this country adequate supplies of chemical laboratory glassware. These articles have ordinarily been imported from Germany and Austria, and they have not hitherto been manufactured in this country except in negligible quantities. Steps to ensure the production of chemical glassware in this country are being taken, but in view of the technical and other difficulties which have to be overcome it must necessarily be some considerable time before there can be production on a large and sufficient scale. Having regard to the extent to which many of the manufacturing industries of the country, including some of special value at the present crisis, require chemical glassware for analytical and other purposes connected with the various industrial processes, it is important that every effort should be made to economise in the use of stocks of such ware now in the hands of educational establishments. These stocks should be examined and a careful record kept of quantities and consumption. Every effort should be made to avoid breakages, and it will probably be found possible to economise in the consumption of "Jena" vessels by the substitution in certain cases of other kinds of glass receptacles. Fresh orders should not be given to manufacturers or supplying agencies for the present, where this can possibly be avoided. The Board of Education is confident that local education authorities and schools and colleges will do their best to assist the Government in the matter.

SOCIETIES AND ACADEMIES.

LONDON.

Mathematical Society, January 14.—Sir Joseph Larmor, president, and afterwards Prof. A. E. H. Love, vice-president, in the chair.—Prof. H. M. Macdonald: A class of diffraction problems.—H. E. J. Curzon: Halphen's transformation.—Dr. A. Young: A Christmas problem in probabilities.—W. E. H. Berwick: The condition that a quintic equation should be soluble by radicles.—Sir J. Larmor: The variation of the earth's angular velocity of rotation.

PARIS.

Academy of Sciences, January 4.—M. A. Perrier in the chair.—G. Bigourdan: The rapid testing of small telescopes. The method proposed, which is easily and rapidly carried out, is a relative one, comparison being made with a standard telescope. The instrument is focussed on a square, one centimetre in the side, containing a group of black lines ruled at equal distances. The number of lines in the centimetre varies from 4 to 20, and the white interspaces are equal in width to the black lines. Details of the mode of testing separating power, astigmatism and field are given.—L. Landouzy: a flexible and non-inflammable gelatine film, suitable for radiology. A description of the preparation and use of thin gelatine plates designed to replace the ordinary glass-coated plates. The unexposed plates, with cardboard supporting frame, weigh 8 per cent. of the weight of the ordinary plate, and after exposure and removal of the film from the frame, this is reduced to 2.8 per cent. Additional advantages as compared with glass plates are cheapness, non-fragility, flexibility, enabling the plate to be inserted into awkward positions without damage, and as compared with celluloid, non-inflammability and perfection of detail.—Edouard Heckel: *Solanum*