

Plato, Leibnitz, Spinoza, or Descartes. Moreover, it is not only the special training or prior avocation of the philosopher that so affects his mind. In divers historical periods the rapid progress or the diffused study of a particular science has moulded the philosophy of the time. So on a great scale in the present day does biology; so did an earlier phase of evolutionary biology affect Hegel; and in like manner, in the great days of Dalton and Lavoisier, did chemistry help, according to John Stuart Mill, to suggest a "chemistry of the mind" to the "association" psychologists? A certain philosopher,<sup>6</sup> in dealing with this theme, begins by telling us that "Mathematics was the only science that had outgrown its merest infancy among the Greeks." Now it is my particular purpose to-day to show, from Aristotle, that this is not the case. Whether Aristotle's biological fore-runners were many or few, whether or not the Hippocratics (for instance) had failed to raise physiology and anatomy to the dignity of a science, or, having done so, had only reserved them, as a secret cult, to their own guild; in short, whether Aristotle's knowledge is in the main the outcome of his solitary labours, or whether, as Leibnitz said of Descartes, *praeclare in rem suam vertit aliorum cogitata*, it is at least certain that biology was in his hands a true and comprehensive science only second to the mathematics of his age.

The influence, then, of scientific study, and in particular of biology, is not far to seek in Aristotle's case. It has ever since been a course or plan to compare the State, the body politic, with an organism, but it was Aristotle who first employed the metaphor. Again, in his exhaustive accumulation and treatment of facts, his method is that of the observer, of the scientific student, and is in the main inductive. Just as, in order to understand fishes, he gathered all kinds together, recording their forms, their structure, and their habits, so he did with the constitutions of cities and of States. Those two hundred and more *πολιτεῖαι* which Aristotle laboriously compiled, after a method of which Plato would never have dreamed, were to form a natural history of constitutions and governments. And if we see in his concrete, objective treatment of the theme a kinship with Spencer's descriptive sociology, again, I think, a difference is soon apparent between Spencer's colder catalogue of facts and Aristotle's more loving insight into the doings and into the hearts, into the motives and the ambitions, of men.

But whatever else Aristotle is, he is the great Vitalist, the student of the body with the life thereof, the historian of the soul.

Now we have already seen how and where Aristotle fixed the soul's seat and local habitation. But the soul has furthermore to be studied according to its attributes, or analysed into its "parts." Its attributes can be variously analysed, as in his "Ethics" Aristotle shows. But it is in the light of biology alone that what amounts to a scientific analysis, such as is developed in the "De Anima," becomes possible; and in that treatise, it is only after a long preliminary physiological discussion that Aristotle at length formulates his distinctive psychology. There is a principle of continuity, a *συνέχεια* that runs through the scale of structure in living things, and so, little by little, by imperceptible steps, does nature make the passage from plant, through animal, to man: it is with all the knowledge summarised in a great passage of the "Natural History," and embodied in this broad generalisation, that he afterwards proceeds to indicate the same gradation in psychology, and to draw from it a kindred classification of the soul.

<sup>6</sup> Ritchie, "Darwin and Hegel," p. 39.

But observe that, though Aristotle follows the comparative method, and ends by tracing in the lower forms the phenomena incipient in the higher, he does not adopt the method so familiar to us all, on which Spencer insisted, of first dealing with the lowest, and of studying in successive chronological order the succession of higher forms. The historical method, the realistic method of the nineteenth century, the method to which we insistently cling, is not the only one. Indeed, even in modern biology, if we compare, for instance, the embryology of to-day with that of thirty years ago, we shall see that the pure historical method is relaxing something of its fascination and its hold. Rather has Aristotle continually in mind the highest of organisms, in the light of the integral and constituent phenomena of which must the less perfect be understood. So was it with one whom the Lord Chancellor of England has called "the greatest master of abstract thought since Aristotle died." For Hegel, as I feel sure for Aristotle, *Entwicklung* was not a "time-process but a thought-process." To Hegel, an actual, realistic, outward, historical evolution seemed but a clumsy and materialistic philosophy of nature. In a sense, the "time-difference has no interest for thought." And if the lower animals help us to understand ourselves, it is in a light reflected from the study of man.

#### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—At a meeting of the electors to the Plumian professorship of astronomy held on April 19 Mr. A. S. Eddington, chief assistant at the Royal Observatory, Greenwich, was elected into the professorship, in succession to the late Sir George Darwin.

The adjudicators of the Adams Prize for the period 1911-12 consider that the two essays submitted to them with the following titles are of distinction: "The Theory of Radiation," by Mr. S. B. McLaren, and "The Fundamental Spectra of Astrophysics," by Dr. J. W. Nicholson, between whom the prize is divided in equal shares.

OXFORD.—The Romanes lecture will be delivered on Thursday, May 8, at 3 p.m., by Sir W. M. Ramsay. The subject is "The Imperial Peace: an Ideal Pervading European History."

The Halley lecture will be delivered on Thursday, May 22, at 8.30 p.m., by Dr. Louis A. Bauer, of the Carnegie Institution of Washington, U.S.A. Subject, "The Earth's Magnetism." The lecture will be illustrated by lantern slides.

On Tuesday, April 22, Convocation authorised the expenditure of a sum not exceeding 6000*l.* for the erection of additional buildings forming an extension of the School of Rural Economy. The money will be provided partly by a grant from the Development Fund of the Treasury, and partly out of the sum presented to the University in 1912 by Mr. Walter Morrison for the promotion of the study of agriculture.

UNDER the title *Educação*, a new fortnightly twelve-page magazine has been started in Portugal, dealing with elementary education, and we have now received the current issues, which commence with January. It contains original articles and reviews, an interesting feature being the series of experiments in elementary physics classed under two categories, namely experiments performed with simple apparatus (such as coffee-pots, kitchen utensils, and the like) and experiments suited for a laboratory.

THE seventeenth annual conference of the Parents' National Educational Union will be held at the Caxton Hall, Victoria Street, S.W., on May 5. Among the subjects of papers are:—Education and social sympathy, J. St. G. Heath; the reading habit and a wide curriculum, Miss C. M. Mason; knowledge and learning, Stanley Leathes, C.B.; and knowledge and its relation to national efficiency, J. L. Paton. Further particulars may be obtained from Miss Parish, 26 Victoria Street, S.W.

THE University of Edinburgh announces the establishment, in October next, of a mathematical laboratory for practical instruction in numerical, graphical, and mechanical calculation and analysis, as required in applied mathematical sciences and for research in connection with the mathematical department. A course of practical work has been drawn up by Prof. E. T. Whittaker, F.R.S., including methods of interpolation, graphic solution of equations, practical Fourier analysis, use of calculating instruments, and calculations of elliptic functions, Bessel functions, gamma functions, and, indeed, new functions not previously tabulated. Prof. Whittaker proposes to give sufficient theoretical explanation to render the more advanced work intelligible to those who have not previously studied the functions of higher analysis.

THE Board of Agriculture and Fisheries proposes to award in October next twelve research scholarships in agricultural science, of the annual value of 150*l.*, and tenable for three years. These scholarships have been established in order to train promising students under suitable supervision, with the view of their contributing to the development of agriculture, either by carrying out independent research, or by acting in an advisory capacity to agriculturists. They will be granted only to students who show distinct promise of capacity for advanced study and research in some one of the sciences bearing on agriculture. Applicants must be graduates of a university, or holders of a diploma of a university or college of university rank, and application should be made not later than June 9 on a form to be obtained from the secretary, Board of Agriculture and Fisheries, Whitehall Place, London, S.W.

THE annual conference of the Association of Teachers in Technical Institutions will be held this year in Bradford at Whitsuntide. The proceedings will be opened on Whit-Monday, when the Lord Mayor of Bradford, Alderman Fred Foster, will officially welcome the conference to Bradford. This will be followed by the address of the president, Mr. P. Coleman, of the Northern Polytechnic Institute. The meeting on Tuesday evening will be addressed by the Right Hon. J. A. Pease, President of the Board of Education, and in view of the introduction of the new Education Bill soon after Whitsuntide, this address will be looked forward to with exceptional interest. This meeting will also be addressed by Dr. M. E. Sadler, Vice-Chancellor of the University of Leeds, Sir William Priestley, M.P., Sir Alfred Keogh, K.C.B., rector of the Imperial College of Science and Technology, Mr. F. W. Jowett, M.P., and others. Papers will be read to the conference on corporate life in a technical institution, by Mr. W. Hibbert, the Polytechnic, Regent Street; vocational education, by Mr. A. C. Coffin, director of education, Bradford, and coordination within a county area, by Mr. F. N. Cook, secretary for higher education in the West Riding of Yorkshire.

THE January issue of the Bulletin of the Massachusetts Institute of Technology contains the report of the president, Dr. R. C. Maclaurin, presented to the

governing body of the institute in December last. Taken in conjunction with that of the previous year, the report shows that during the last eighteen months nearly 1,400,000*l.* has been paid or promised by way of gift to the Massachusetts Institute of Technology. The principal items include 600,000*l.* for buildings, 160,000*l.* for land, 320,000*l.* for general endowment, 150,000*l.* for endowment of the department of naval architecture, 40,000*l.* for scientific research, and 100,000*l.* for scholarships. It is not surprising to find that the institute attracts students from all parts of the United States, and, indeed, from all parts of the world. Students come in large numbers from China, South America, Canada, and in considerable numbers from Europe, India, Egypt, South Africa, and a few from Australia. The proportion of foreign students at the institute is more than double that at almost any other institution in the United States. The number of students on November 1 last reached 1611, the largest in the history of the institute. The total number of members of the teaching staff for these students was 254, of whom 56 were full professors, while there were, in addition, 16 research professors.

#### SOCIETIES AND ACADEMIES.

**Royal Society**, April 17.—Sir Archibald Geikie, K.C.B., president, in the chair.—Dr. W. Watson: The luminosity curves of persons having normal and abnormal colour vision. The author has calculated the form of the luminosity curves corresponding to different degrees of deficiency of the red and green sensation, and shows that in the great majority of cases of colour blindness the observed points agree with the calculated curves, and hence the correctness of Sir W. Abney's sensation curves and his theory as to partial colour blindness is supported. The cases of abnormal luminosity curves given by persons having normal colour vision are shown to be probably due to variation in macular pigmentation.—Prof. W. H. Bragg and W. L. Bragg: The reflection of X-rays by crystals. The paper deals with the reflection of a beam of X-rays by the cleavage faces of various crystals, an ionisation method being employed to measure the strength of the reflected rays. The apparatus corresponds to a spectrometer, the parallel planes in which the atoms of the crystal are arranged taking the place of the lines of a grating, and the ionisation chamber that of a telescope. A fine slit in front of the X-ray bulb allows a beam of rays to fall on the face of the crystal, and both crystal and ionisation chamber turn about the axis of the instrument and can be set at any desired angles. By this method evidence has been found of the existence of three very homogeneous components in the rays from the bulb employed, which are only reflected from the crystal at definite angles. They show as a very strong reflection superimposed on the general reflection which takes place at all angles. Each of these has a definite absorption coefficient in aluminium, and can be recognised when reflected from many crystals. The absorption of the homogeneous rays in different metals corresponds in all respects to the absorption of characteristic X-rays.—Prof. J. C. McLennan: A fluorescence spectrum of iodine vapour.—Dr. W. Wahl: The relation between the crystal-symmetry of the simpler organic compounds and their molecular constitution. Part I.—Prof. H. E. Armstrong and E. E. Walker: Studies of the processes operative in solutions. XXVIII., The causes of variation in the optical rotatory power of organic compounds and of anomalous rotatory dispersive power. Attention is directed to the explanation of the anomalous rotatory dispersive power displayed by some organic compounds,