

on the move in matter, and are the carriers of heat and electricity. Whether it still undergoes transformations is a question we may well ask; I will consider it very briefly in a few minutes.

Transformation in either direction can only take place during the traverse of an atom. The atom is the transforming agent, but atoms differ in their transforming power. Usually the heavier the atom the more apt it is to bring about the transformation in an X-ray which tries to cross it, but there are regular exceptions. Every atom possesses one or more critical energy quantities; if the energy of the X-ray exceeds the critical value of the atom it is much more likely to undergo transformation than if it falls short. The critical values grow with the atomic weights, and are on the whole nearly proportional to the squares of the latter. Thus the critical energy of the zinc atom is about 1.75×10^{-8} ergs, of the nickel atom about 1.67×10^{-8} ergs. An X-ray, having an energy less than both these, is absorbed or transformed rather more readily by zinc than by nickel, but an X-ray having an energy greater than the lower but not greater than the higher (e.g. the X-ray given off by zinc when irradiated by sufficiently penetrating primary X-rays, and now known as the Zn X-ray) is actually much more readily transformed by the nickel than by the zinc.

Moreover, I believe this to be capable of extension. It is not only the X-ray that must possess energy greater than the critical value of the atom if transformation is to take place readily, but also a β ray must possess energy above the same limit if it is to be turned readily into an X-ray. Consequently a β ray is more apt to disappear in its energy exceeds the limit than if it falls short, and a stream of β rays seems actually to have less penetration than it would have if the individual rays were moving more slowly. I think I am in a position to show this as the result of recent experiment; I have found it to be so in the few cases I have tried, but there are very few cases which it is possible to try.

(To be continued.)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

MILL HILL SCHOOL has recently received a gift of 500*l.* from Mrs. Richardson, one of the nieces of the late Lord Winterstoke, formerly chairman of the governors of the school.

MAJOR SIR RONALD ROSS, K.C.B., F.R.S., formerly professor of tropical medicine, University of Liverpool, is now professor of tropical sanitation, University of Liverpool, lecturer on malaria, Liverpool School of Tropical Medicine, and physician for tropical diseases, King's College Hospital, London.

THE REV. JOHN H. ELLIS, who died in November last, has left, subject to his widow's life interest, the residue of his property, which will amount to at least 90,000*l.*, to "the University of Cambridge to be enjoyed and applied both as to capital and income by them for the general purposes of the University in such manner as they may think fit."

THE December issue of *The Reading University College Review*, in addition to its very interesting notes summarising the work recently accomplished at the college, contains an article explaining the general idea of the scheme of new buildings which the council of the University College at Reading proposes to carry out upon the main site. Another article, by Mr. J. P. Clatworthy, lecturer in mathematics at the college, deals with mathematics and the biological sciences.

THE danger of over-specialisation in higher education forms the keynote of a paper on the functions of the American college, by Prof. A. K. Rogers, in *The Popular Science Monthly* for December. As the author points out, there is a constant tendency among college teachers to cater more and more for the specialist in their own particular study, whereas if the college is to maintain its influence, it should rather aim at broadening the minds of the large majority of students of average ability. The author remarks that "the exceptional man is pretty apt to look out for himself. He will thrive probably in spite of our attempts to educate him quite as much as because of them."

THE President of the Board of Education has decided to appoint an advisory council for the Victoria and Albert Museum. The following persons have already consented to serve: The Right Hon. Lord Reay (chairman), Mr. R. H. Benson, Mr. R. Blomfield, Sir Edward T. Cook, Mr. J. H. Fitzhenry, Mr. R. E. Fry, Mr. Frank Green, Lady Horner, Mr. Elijah Howarth, the Earl of Lytton, the Countess of Plymouth, Sir Isidore Spielmann, C.M.G. The council will be asked to advise the Board on questions of principle and policy arising from time to time, and to make an annual report on their proceedings to the Board, together with any observations on the condition and needs of the museum which they may think fit to make. It will be open to the council to constitute subcommittees on which persons who are specially qualified to advise on particular questions referred to the council may be invited by the Board to serve in addition to the ordinary members of the council.

THE fourteenth of a series of articles which has been appearing in the *Journal of the Department of Agricultural and Technical Instruction for Ireland* has now been issued in pamphlet form. It is written by Mr. T. Clearkin, and is concerned with technical instruction in Larne. Larne differs from many small towns of Ireland, as it has various flourishing industries giving constant employment to a considerable number of skilled workers—men and women. Many of these industries have grown up within the last twenty years, e.g. the manufacture of aluminium, linen-weaving, and paper-making. The shipping industry, too, is of some importance, and the engineering and building trades give employment to a fair number of apprentices. The object of the municipal technical school which has now been established in Larne is to instruct in the scientific and artistic knowledge necessary for a thorough understanding of the several callings in which the inhabitants are already engaged.

THE scheme of the competitive examination, held under the direction of the Civil Service Commissioners, for admission to the Indian Police Force is to be modified, by requiring candidates to take up English history and geography as a compulsory subject. The change will come into operation for the examination of 1914. There will then be four obligatory subjects which must be taken by all candidates, viz. English, elementary mathematics, French or German, and English history and geography. There are six optional subjects, of which candidates may take two; but, if one of the subjects selected is a modern language, it must be different from that taken as an obligatory subject. The optional subjects are intermediate mathematics, higher mathematics, German or French, Latin, Greek, and science (physics and chemistry). In addition, candidates may take up free-hand drawing. The maximum mark obtainable is the same for all subjects, except free-hand drawing,

which carries only one-fifth of the mark in other subjects.

THE address delivered by Prof. Nicholas Murray Butler, president of the Columbia University, on the occasion of the dedication of the State Education Building at Albany, N.Y., last October, has been issued as a reprint from *The Educational Review* of New York. The subject of the address is the service of the university. The prime thought which underlies and gives purpose to the whole educational policy of New York from its very beginning, says Prof. Butler, is that educational progress is a unit, and that its supervision and control should be gathered into one single department of State education. Later in his address he provided an admirable definition of a university. He referred to it as "an institution where students adequately trained by previous study of the liberal arts and sciences are led into special fields of learning and research by teachers of high excellence and originality, and where, by the agency of libraries, museums, laboratories, and publications, knowledge is conserved, advanced, and disseminated. Teaching is only one function of a university, and perhaps the smallest one. Its chief function is the conservation, the advancement, and the dissemination of knowledge, the pushing out of that border line between the known and the unknown which constitutes the human horizon."

THE following advanced lectures in scientific subjects have been arranged for the present term by the University of London. Unless otherwise stated, admission is free without ticket. Detailed information will be found in *The London University Gazette* of January 1:—"The Illustration of Botanical Papers," Mr. T. G. Hill; "The Morphology of Gnetales," Prof. Margaret Benson; "The Theory of the Solid State," Prof. W. Nernst, professor of physical chemistry and director of the Institute of Physical Chemistry in the University of Berlin; "The Growth in Length of the Vertebrate Embryo," Mr. Richard Assheton; "Recent Work on the Bionomic Value of Colour in Animals, especially Insects," Prof. E. B. Poulton, F.R.S.; "Meteorology in Relation to the Navigation of the Air," Dr. W. N. Shaw, F.R.S. (in this case application for tickets of admission should be made at the Meteorological Office); "The Relations of Electrolytes to Living Tissues," Mr. G. R. Mines. (These lectures are for advanced students of the University and others interested in physiology. Any member of a London school of medicine, whether an undergraduate of the University or not, is entitled to admission to this course.) "The Protozoa," Prof. E. A. Minchin, F.R.S. (The course is open free to all members of the University, to all medical men or registered medical students, and to other persons, on application to the academic registrar.) "Some Hitherto Neglected Sources of Error in Mine-surveying and their Elimination or Reduction by Improvements in Instruments or Methods," Mr. L. H. Cooke. Six lectures in connection with the Francis Galton Laboratory for National Eugenics will be given at University College on Tuesday evenings, at 8 p.m., beginning on February 11. Admission to this course is free, but by non-transferable ticket, applications for which should be sent to the secretary of University College.

SOCIETIES AND ACADEMIES.

MANCHESTER.

Literary and Philosophical Society, December 10, 1912.—Prof. F. E. Weiss, president, in the chair.—T. A. Coward exhibited a fossil, barrel-shaped pith of a

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cycadean stem with small portions of the surrounding wood, with superficial markings due to the medullary rays, from a brickfield near Timperley.—T. A. Coward: Coloured photograph of a specimen of the Baikal or Formosan teal, *Anas formosa*, shot at Wirral a short time ago.—A. Holt and J. E. Myers: The constitution of the phosphoric acids and some of their alkali salts. There appear to be but two varieties of metaphosphoric acid and two corresponding series of salts. These salts are derived from mono- and tri-metaphosphoric acids. The tri-acid is vitreous; the mono-acid can only be obtained in solution. The monometaphosphates of the alkalis are readily soluble in water, and are prepared either by neutralising the mono-acid or by devitrifying the glass obtained by the action of heat on microcosmic salt. This is in direct contradiction to the customary statements of text-books. The more complex metaphosphates are probably double salts.—Miss P. C. Esdaile: The scientific results of the salmon scale research at Manchester University. The results obtained by an examination of scales from nearly 1700 fish from the Wye indicate some relation between the length of time spent in the river and in the sea. In the majority of cases, when the young fish has stayed for a considerable time in the river it has remained for a comparatively short while in the sea, and *vice versa*. Grilse and small spring fish with a comparatively short sea-life are longer for their weight than large summer or large spring fish, and also show much more variation. Only seventy-eight of the fish had spawning marks on their scales. It was observed that fish which one year spawned as spring fish may spawn again as summer fish, and *vice versa*. The results indicate that the scales do not provide any evidence to support the belief that spring and summer salmon represent two distinct races.—Dr. J. R. Ashworth: Note on the mean magnetic moment and energy of a vibrating magnet. By a mathematical investigation the author showed that the behaviour of a magnet making oscillations of large amplitude in a uniform field resembles that of a diamagnetic substance. When, however, it oscillates under the influence of a similar neighbouring magnet its behaviour has a resemblance to that of a ferromagnetic substance under the influence of heat, and the phenomenon of recalcence could in some degree be imitated under like conditions.

BOOKS RECEIVED.

Memoirs of the Geological Survey, Scotland. The Gemology of Ben Wyvis, &c. By Dr. B. N. Peach and others. With petrological contributions by Dr. J. S. Flett. Pp. x+189+xii plates. (Edinburgh: H.M.S.O.; London: E. Stanford, Ltd.) 4s.

Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India (New Series). No. 54, Studies on the Mouth Parts and Sucking Apparatus in the Blood-sucking Diptera. No. 1, *Philaematomyia insignis*, Austen. By Captain F. W. Cragg. Pp. 3+17+iv plates. (Calcutta: Superintendent Government Printing, India.) 1s. 3d.

Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India (New Series). No. 55, The Structure of *Haematopota pluvialis*, Meigen. By Captain F. W. Cragg. Pp. 3+35+vii plates. (Calcutta: Superintendent Government Printing, India.) 1s. 9d.

Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India (New Series). No. 56, Malaria in the Andamans. By Major S. R. Christophers. Pp. 4+48. (Calcutta: Superintendent Government Printing, India.) 1s. 4d.