mark of a live man, and what he wanted in his business was live men. That was only one way of expressing the doctrine you have all heard preached. That doctrine concerns the value of research. For, after all, what is meant in this connection by research is just this, that the student is brought face to face with some of the living problems on the growing edge of his subject, and is shown how to deal with them. Such a training is invaluable; but it cannot be adequately tested by a written examination, nor even by a practical examination lasting only a few hours. Hence the importance of giving the teacher who has watched and supervised such work a voice—not, of course, the sole voice, but still an effective voice—in the selection of those on whom a degree is to be conferred. In all the provincial universities the teacher cooperates with the external examiner in gauging the capacity of an undergraduate, and so it will be in Bristol.

It must be remembered that the training of undergraduates, though an important part of the work of a university, is not its only work. A university is not only a place where knowledge is imparted, but where knowledge is made. Apart from the minor researches of undergraduates—which really constitute a training in research—there are the major researches of the staff and of post-graduate students. If the University of Bristol is to take its proper place in the community of provincial universities, the professors and lecturers must have the capacity, and must be given the requisite time, for such research. I will not enlarge upon this subject. I will only direct attention to the fact that there are important agricultural problems and some fishery problems which await solution in the district round us, and to the solution of which I trust the University of Bristol will contribute. The university should be regarded as the natural centre of research in such matters. There must be a great number of commercial problems on which skilled work is required. I should like to see the University specialise on some of these. We shall need, too, some local colour in our University. I cherish the hope that a Cabot chair of geography may be founded in Bristol, where a carefully organised training in this subject, both in its more academic and in its commercial aspect, will be developed.

I have, so far, refrained from making any reference to the system of education which has of late years been developed in Germany. Nor do I now propose to trouble you with statistics and details. On one salient characteristic I venture to comment. Mr. Haldane has directed attention to what he regards as a growing feature of German life, which finds expression in "the double aim of the German university system—pure culture, on the one hand, and on the other the application of the highest knowledge to commercial enterprise." Germany has realised, as England is only beginning to realise, and that somewhat slowly, that the application of the highest knowledge to commercial enterprise is the secret of industrial success. In England the university professor is too often regarded by practical men as an upper schoolmaster, whose doctrinaire notions are of little value outside his class-room or his laboratory; but when some months ago the Chancellor of the Exchequer went into one of the largest workshops of Germany, he was taken round by a professor. He asked what a professor had to do with it, and was told, "the professors are our experts." The Germans, Mr. Lloyd George said, get their ideas from their professors. He regarded the universities as factories where the future of the country is being forged and he gave it as his opinion that there is no investment that will produce such a return, not to the investor, but to generations to come, as the endowment of higher education.

That, then, is one aspect of the function of a university. It should contribute to the work of the world at the highest level of efficiency. Twenty years ago Lord Salisbury said, "Man's first necessity is to live, his first duty is to work, and the object of education is to fit him for his work"; but man does not live by work alone. To achieve success in commercial warfare in the field of industrial competition is not the sole aim of education. This alone will not make a nation great. You will perhaps pardon one who is, in part at least, a philosopher by trade, for quoting Aristotle:—"The whole of life," we read in his "Politics," "is divided into two parts—business and leisure, war and peace—and all our actions are divided into such as are necessary and useful, and such as are fine. We have to be busy and to go to war, but still more to be at peace and in the enjoyment of leisure. We must do what is useful and necessary, but still more what is fine. These are the aims we have to keep in view in the education of our children, and people of every age that require education." This is the doctrine of culture, a doctrine which, I trust, the University of Bristol will strive to carry out in practice not less sedulously than that of the application of the highest knowledge to commercial enterprise.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

AT the monthly meeting of the governors of the Imperial College of Science and Technology on April 2 it was decided, subject to the approval of the King in Council, to recognise the metallurgical department of the University of Sheffield as being in association with the Imperial College of Science and Technology for the advanced metallurgy of iron and steel, as provided for in the charter.

ON April 2, at Edinburgh University, the honorary degree of LL.D. was conferred upon Mr. J. G. Bartholomew, hon. secretary Royal Scottish Geographical Society; Prof. A. Crum Brown, F.R.S.; Prof. W. Burnside, F.R.S., Royal Naval College, Greenwich; Prof. Taylor; Sir Alfred Keogh, K.C.B., Director-General of the Army Medical Service; Prof. C. H. Kronecker, University of Berne; and Dr. J. E. Sandys, Public Orator in Cambridge University.

AMONG recent gifts to higher education in the United States, *Science* announces a donation of 35,400*l.* from Mr. J. D. Rockefeller to the University of Chicago. The New York *Evening Post* states that the University of Missouri will receive 100,000*l.*, for the assistance of needy students, by the will of the late Mr. C. R. Gregory, of St. Louis. The Weyerhauser interests of St. Paul have given to the University of Minnesota 2200 acres of land in Carlton County for the use of experiments by the forestry department.

A COMMITTEE has been appointed by the Treasury to consider the statements of claims to additional State assistance and estimates of the amounts needed for the respective services, which have been supplied by the Scottish universities at the request of His Majesty's Government; and to report as to what assistance, if any, should be granted from public funds in the interests of the proper development of the work of the universities, due regard being had to the coordination of their work with that of other institutions in Scotland giving instruction of a university standard. The committee is composed of the following members:—the Earl of Elgin and Kincardine, K.C. (chairman), Miss Haldane, Sir Kenelm Digby, G.C.B., Principal Sir Harry Reichel, Mr. C. M. Douglas, Prof. A. R. Forsyth, F.R.S., and Prof. G. Sims Woodhead.

SOMERVILLE COLLEGE, Oxford, is offering, for the third time, a research fellowship of the annual value of 120*l.*, tenable for three years, for which application must be made before May 15 to Miss H. Darbishire, Somerville College, Oxford. The fellowship is now, for the first time, open to women students of Cambridge and Trinity College, Dublin, as well as of Oxford. The two fellows hitherto elected have done valuable original work. Miss E. Jamieson was engaged in researches among the archives in Monte Cassino, La Cava, and Sicily, with a view to the constitutional history of the reign of Roger II. of Sicily. Miss F. Isaac has been engaged in research on the nature and properties of supersaturated crystalline solutions and mixtures, and the results of her work have been published in the Proceedings of the Royal and other scientific societies.

THE Board of Education has published a volume which contains particulars of the application of funds by local authorities in England and Wales to the purpose of education, other than elementary, in the financial year ended March 31, 1907. The returns deal with secondary educa-

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tion—including, not only secondary schools, but also the instruction of pupil-teachers—the training of teachers, the provision of scholarships, evening schools or the various forms of technical instruction, and higher education in science and in art generally. A diagram has been introduced into the Blue-book this year showing graphically, for three years, including 1906–7, the comparative rise and fall of certain selected items of expenditure, other than out of loans, of local authorities for classified groups of areas. The income from all sources for meeting the year's expenditure showed a total increase, as compared with the previous year, 1905–6, of nearly 213,000*l.*, and the increased amount raised from rates was equivalent to about 97 per cent. of that total. The total expenditure on higher education, as already defined, was, during the year, 3,680,718*l.*, as compared with 3,355,434*l.* in the previous year. In 1906–7 the expenditure under various headings was as follows:—for secondary education, 1,068,655*l.*; for evening schools and institutions for higher and technical education, 1,475,358*l.*; for exhibitions, including scholarships, bursaries, and the payment of fees, 448,769*l.*; for training of teachers other than pupil-teachers, 98,599*l.* In addition to these items, administrative and legal expenses accounted for 198,073*l.*, other expenses amounted to 120,320*l.*, and 220,480*l.* was paid in respect of loans.

THE thirty-sixth annual dinner of the "Old Students" of the Royal School of Mines was held on March 30, under the chairmanship of Mr. F. W. Rudler, supported by many distinguished guests and old School of Mines men, as well as old students of the Royal College of Chemistry and Royal College of Science. The "Royal School of Mines" was proposed by Sir William H. White, who referred to the admirable record of the school and to the intention of the governing body that its reincarnation should render it second to none in the world. Mr. Rudler, in replying, referred to the early history of the school and to the necessity for combining theory with practice on the lines which had been laid down in drawing up the plans for the new laboratories and testing floors, and expressed the hope that it might be possible to found a chair of economic geology. The toast of "The Visitors," proposed by Mr. Bedford McNeill, was responded to by Mr. A. H. Dyke Acland, who pointed out that "character and grit," as well as the admirable training in the reorganised Royal School of Mines, are essential to a student's success. In concluding, Mr. Acland referred to the proposed students' union building, which he hopes will worthily represent the governors' desire for the bodily and mental welfare of the students, both of the Royal School of Mines and of the other colleges, &c., connected with the Imperial College of Science and Technology. In replying to the toast of "The Chairman," Mr. Rudler referred to the loss sustained by the mining and metallurgical professions by the death of Bennett H. Brough. Provision for the widow and children has been made by the Iron and Steel Institute, and it is now proposed to invite subscriptions for an entirely different purpose, which is for the formation of some permanent memorial to perpetuate the memory of one who was widely honoured and loved. Notices will be sent out shortly with the view of the foundation of a scholarship at the Royal School of Mines. All who knew Brough will agree that such a scholarship is the very thing which he would have desired, and that a more fitting occasion could not have been chosen for this—the first official announcement of what had been in the minds of so many since the death of their old friend.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 21.—"The Photo-electric Fatigue of Zinc.—II." By H. Stanley **Allen.** Communicated by Prof. H. A. Wilson, F.R.S.

In a former paper (Roy. Soc. Proc., A, vol. lxxviii., p. 483, 1907) an account was given of the way in which the photo-electric activity of zinc diminishes when the metal is exposed to light from a Nernst lamp.

The experiments described in the present paper were carried out to determine whether the results were similar when using a source of light giving far more ultra-violet radiation than the Nernst lamp. A mercury-vapour lamp of fused quartz was employed.

The method of experimenting was similar to that described in the previous paper, but the testing cell, consisting of the zinc plate and a positively charged sheet of wire gauze, was in the open air instead of being enclosed in a brass case.

Conclusion.—The photo-electric activity of a zinc plate decays in such a way that it can be represented as the sum of two exponential terms. The constants of change are but little altered by considerable variations in the character and intensity of the illumination employed, though the value of the photo-electric current is changed considerably. The rate at which the surface is altered is not greatly affected by using a mercury-vapour lamp in place of a Nernst lamp.

Royal Microscopical Society, March 17.—Mr. E. J. Spitta, vice-president, in the chair.—The optical examination of a crystal section in a rock slice: Dr. J. W. **Evans.** —*Synchaeta fennica*, sp.n., and on the resting-egg of *S. pectinata*: C. F. **Rousselet.**

Mineralogical Society, March 23.—Principal H. A. Miers, F.R.S., president, in the chair.—A stage goniometer for use with the Dick pattern of microscope: Prof. H. L. **Bowman.** The form of goniometer, intended to be screwed to the stage of a microscope with rotating Nicols, which was designed by Principal Miers, has been slightly modified by the author with the view of securing increased rigidity and ease of control. The instrument is adapted for supporting and manipulating a small crystal during the examination of etching-figures or other features requiring high magnification, as well as for the determination of its optic axial angle in air or oil, and the extinction angles and other optical characters of the various faces. It is provided with screw motions for adjusting and centring the crystal, and for regulating the height of the axis above the stage.—The electrostatic separation of minerals: T. **Cook.** Conductivity is a much more important factor than specific gravity in determining the behaviour of mineral fragments under the influence of an electrostatic charge. The greater susceptibility of good conductors as compared with bad conductors can be made still more pronounced by providing for the escape of the repelled opposite charge, which takes place rapidly in good conductors and slowly in bad conductors. It was shown that, in consequence of this fact, grains of such good conductors as ilmenite, pyrites, galena, or wolfram can be easily separated by means of a rubbed piece of sealing-wax from admixed grains of bad conductors, such as calcite, quartz, fluor, or monazite. Minerals having a metallic lustre are good conductors, whereas those which are colourless and highly transparent are bad conductors. It is suggested that there is probably a much closer connection between the conductivity of a mineral and its general optical properties than has been hitherto suspected. —The identity of guarinite and hiortdahlite: Dr. F. **Zambonini,** with chemical analysis by Dr. G. T. **Prior.** The rare mineral guarinite, which occurs sparingly in small yellow crystals in the sanidinite bombs of Monte Somma, has been hitherto regarded as orthorhombic, and as essentially a complex silicate of lime, alumina, and soda. A new investigation made by the author on crystals showing terminal faces shows that the mineral is really triclinic, and identical both crystallographically and optically with hiortdahlite. Crystals of guarinite show polysynthetic twin lamellæ with oblique extinctions like those exhibited by crystals of hiortdahlite. The chemical analysis showed that the mineral is essentially a fluosilicate and zirconate of lime and soda, practically identical in composition with hiortdahlite, although the percentage of fluorine was lower than that given in Cleve's analysis of the latter mineral. The numbers obtained in the analysis correspond closely to a formula

$$3CaSiO_3.Ca(OH,F)Na.ZrO_2.$$

—Note to a paper on the comparison of refractive indices of minerals in thin sections: Dr. J. W. **Evans.** Parallel Nicols are placed so as to bisect the angle between the

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