

schemes referred to in the report, and generally approved by competent persons, should be taken up by the Advisory Council on Atmospheric Pollution, who should bring it before the notice of the public in the form of active propaganda. It seems useless to make yearly records of air pollution when no serious steps are being taken, publicly or privately, to diminish the evil.

J. B. C.

### Work of the Analytical Laboratory, Cairo.

SEVERAL features of more than passing interest are shown in the undermentioned report.<sup>1</sup> Covering as it does the period of the war, it chronicles work—such as the making of special incendiary bombs and chemical igniters for flares—which is rather unusual for the analytical laboratory, but is an indication of versatility in time of need. Passing, however, to more normal activities, with a bare mention of the excellent routine work done, it is interesting to note that research has taken a definite place in the programme of the department; the authorities are evidently alive to the importance of encouraging the application of chemistry to arts and manufactures. Thus an investigation of Egyptian crude petroleum has been made, the results of which have proved that good yields of Diesel fuel-oil can be obtained from this source, besides the customary petroleum spirit and kerosene, and a pitch which will be invaluable for road-making. A Government refinery to deal with this crude petroleum is to be erected at Suez.

An inquiry into the possibility of cement manufacture in the Sudan was also undertaken. As a result a cement factory is now being constructed at Makwar, where 50,000 tons of cement per annum will be made; the fuel difficulty has been overcome by using a mixture of locally made charcoal and imported coke.

Among the chemico-legal cases dealt with was an interesting one in which a claim was made against the Government for land valued at about 16,000,000*l.* Unfortunately for the claimant, however, it was found that out of the 168 documents on which the claim was based no fewer than 163 were forged.

It is noted that an entirely new method of assaying gold has been devised, whereby the Assay Office was enabled to cope with a very considerable increase of work resulting from the new assay law, which provides for the compulsory hall-marking of gold and silver. The report indicates useful work and steady progress.

### The Problem of Soaring Flight.<sup>2</sup>

THE source of energy used by birds in soaring flight is not yet clearly known. Attempts have been made to achieve this form of flight artificially, and, according to Gustav Lilienthal, a flight of 500 metres up wind, in which a height of 40 metres was attained, has been made by a man-carrying glider not provided with a motor, but having wings constructed on the pattern of those of a soaring bird.

The extraordinary regularity with which cranes, when flying in a group, keep their distances from one another affords a proof that such soaring flight is either due to undiscovered wing-movements or to some condition of the air which is widely and uniformly distributed. The observation that certain dragon-flies, and also flying-fishes, employ soaring

flight has led to discoveries that throw a new light on the subject. Dragon-flies can adjust their abdomens and hind-legs, and flying-fishes their pelvic fins, in such a way that these organs act as a brake to check speed when flying. The brake is used in certain conditions in continued flight to keep their speed at a required minimum. This use of an air-brake yields a proof that these instances of soaring flight are not due to undiscovered wing-movements. Dragon-flies habitually avoid ascending currents when in soaring flight so long as the sun is shining. If isolated clouds are crossing the sky these insects collect in the neighbourhood of a convenient ascending current, entering it whenever the sun is obscured, and gliding beyond its range so soon as the sun comes out. That soaring flight is not due to the lifting effect of lateral gusts is proved by the fact that the flying-fish when at highest speed carries its wings inclined so that the wing-tips are on a lower level than the body. In this case, if lateral gusts were operative, their only effect would be to drive the fish under water.

Certain facts suggest that turbulent motion is, in some unknown way, the source of the energy of soaring flight. But light objects, such as feathers or aerial seeds, may be seen floating in the air in the neighbourhood of soaring birds, and exhibiting only slow and equable movement. What form of turbulent motion can be imagined that enables a bird weighing 10 lb. or more to glide without effort to a height of 2000 metres or to travel horizontally for indefinite distances at a speed of 50 miles an hour, and yet is unable to disturb the course of a piece of thistle-down? Thus the facts of the case appear to offer insuperable difficulties to all theories that have hitherto been put forward as an explanation of soaring flight.

### University and Educational Intelligence.

CAMBRIDGE.—The proposal to admit women to membership of the University on equal terms with men was rejected on December 8 by 904 votes to 712. The next step, presumably, will be a vote on Report B, the alternative proposal offered by the recent syndicate. This is, in effect, a suggestion on the part of the University that it would welcome the foundation of a separate University for women at Cambridge, and would extend to it the same facilities for educational purposes as are at present offered to the members of Girton and Newnham Colleges. This proposal does not in any way meet the greater number of the difficulties that were raised in connection with the rejected scheme, in particular the question of numbers and accommodation. It has already been rejected by the women's colleges, which have declared that they have no intention of taking action in the matter of forming a separate University even if Report B is passed. Already three of the six signatories of Report B have, in a sense, abandoned it for some scheme which shall more nearly meet the women's needs, a scheme the details of which have yet to be worked out. It does not look as though the adoption or rejection of Report B by the University will bring the problem nearer to an agreed settlement. In the interests of the University as a whole, and of the women's colleges in particular, an early settlement must be reached, and it looks as though the next move must lie with "the party of thirteen," who have in view a scheme which will give the women the full privileges of membership of the University without any control over the men's education. If they take early and effective action they may be able to justify

<sup>1</sup> "Report on the Work of the Government Analytical Laboratory and Assay Office, 1913-1919." (Ministry of Finance, Egypt.)  
<sup>2</sup> Abstract of a paper by Dr. E. H. Hankin and F. Handley Page read before the Cambridge Philosophical Society on November 22.

the vote of last Wednesday; otherwise, this vote must bring a reaction which may, in due course, sweep much farther than the original proposals.

Mr. J. Gray, fellow of King's College, has been elected Balfour student.

LONDON.—Mr. F. R. Fraser has been appointed for a period of four years as from October 20 last to the University chair of medicine tenable at St. Bartholomew's Hospital Medical School. In 1912 Mr. Fraser was appointed assistant in medicine at the Rockefeller Institute for Medical Research in New York, and two years later instructor in clinical medicine at Columbia University. During the war he served with the R.A.M.C., and on demobilisation was appointed assistant director of the Medical Clinic and assistant physician at St. Bartholomew's Hospital. He is the author of publications on electrocardiographic changes and acute poliomyelitis.

OXFORD.—Mr. R. T. Gunther, fellow and tutor of Magdalen College, has been elected by that college to a research fellowship in order to continue his researches on land levels in the Mediterranean. A science tutorship at Magdalen will thus become vacant, and it will certainly be acceptable to biologists in Oxford if another biologist be elected to succeed Mr. Gunther. Magdalen College has long been favourably distinguished for the support it has given to scientific study and research, especially in subjects connected with the sciences of life.

PROF. J. C. IRVINE, professor of chemistry in the University of St. Andrews, has been approved by the King, on the recommendation of the Secretary for Scotland, as Principal of the University in succession to the late Sir John Herkless.

APPLICATIONS are invited by the council of Bedford College for Women, Regent's Park, for a scholarship in sociology tenable at the college for two years, and of the yearly value of 80*l.* Candidates must be women holding a university degree or its equivalent. The latest date for receiving applications is January 15.

THE Association of Science Teachers will hold a general meeting on Tuesday, January 4, at University College, London, when the presidential address will be delivered by Miss M. B. Thomas, Girton College, and a lecture on vitamins will be given by Dr. J. C. Drummond, reader in physiological chemistry, University College. The hon. secretary of the association is Miss E. M. Ridley, 10 Gresley Road, London, N.19.

THE Salters' Institute of Industrial Chemistry has awarded five fellowships for post-graduate study in the laboratories indicated:—Mr. A. H. Adcock (Liverpool University), Mr. J. A. Gentle (Oxford), Mr. S. J. Saint (Reading), Mr. C. B. Taylor (Imperial College of Science and Technology), and Mr. Donald Turner (Sheffield). Scholarships have been awarded to Messrs. M. D. Forbes and G. M. Lowe (Imperial College of Science and Technology), A. W. Pritchard and F. W. Turner (East London College). Forty-five grants in aid have been awarded to chemical assistants occupied in factories in or near London to facilitate their further studies.

ANNOUNCEMENT has been made that four fellowships of 1000 dollars each have been established through a co-operative agreement between Yale University and the Bishop Museum of Honolulu, Hawaii. The fellowships are available for graduates of any institution, but are primarily designed for students who have already attained the degree of doctor of philosophy. Preference will be given to applicants who

desire to carry on research in anthropology, botany, zoology, geography, or geology in Hawaii or other parts of Polynesia. Detailed information may be obtained from the Dean of the Graduate School, Yale University.

THE annual meeting of the Mathematical Association will be held at the London Day Training College on Tuesday, January 4. The programme includes the following papers and discussions:—Relativity, Prof. A. S. Eddington; Aeroplane Mathematics, Dr. S. Brodetsky; The Teaching of Mathematics to Boys whose Chief Interests are Non-Mathematical, the Rev. S. H. Clarke; Some Unsolved Questions and Topics for Research, Prof. E. T. Whittaker; Results of Visits Paid to Lycées of Paris and other Centres, and the Study of Education there, particularly from the point of view of Mathematics, Miss E. M. Read. January 17, 1921, will be the fiftieth anniversary of the first recorded meeting of the association.

PROF. DONNAN gave an interesting address on "The Finance of Research at Universities" at a meeting convened by the London branch of the National Union of Scientific Workers at University College on December 9. He said that scientific research must be financed mainly out of Treasury funds, and as the Treasury is influenced greatly by public opinion, it behoves scientific workers to create the right atmosphere. The Government, no less than the general public, is apt to overlook the fact that there are three equally important factors in the creation of wealth. Two of these, new knowledge and trained men to apply it, are the right products of the universities; increased production is not merely a question of the hours of labour of the manual worker. The nation has already reached a time of financial stress which will probably continue for another five years. Hitherto the Government has treated educational institutions as charities, to be given doles in times of prosperity, to be ignored at the call for economy. Unhappily, this attitude is unchanged, and the prospect of universities receiving the necessary financial assistance from the Treasury for research workers is a poor one unless the Department of Scientific and Industrial Research realises in time that this is the more productive field for cultivation, and unless those best equipped and best entitled to benefit by grants, viz. the junior teaching staffs, are aided to undertake research work instead of being forced by inadequate salaries to make ends meet in other ways. Prof. Donnan concluded by paying a tribute to the work of the Department of Scientific and Industrial Research in fostering industrial research associations, but expressed the doubt as to whether it would not have been the more profitable investment to have started with the university research workers.

ANYONE who understands the best possibilities of the kinematograph, or has seen some of the instructive films now available, must realise that the instrument may be made a very valuable educational aid. In scientific instruction, for example, the slowing down of ultra-rapid pictures enables movements to be analysed most clearly; or, on the other hand, a film may show in a few minutes the life-history of a plant or animal, and thus synthesise changes which may extend normally over several months. Whatever can be said in favour of the use of pictures in text-books can be applied with far greater force to the motion picture, for movement impresses itself upon the mind much more deeply than still-life. This is particularly true of geographical subjects, the aim of which is to give pupils clear ideas of the characteristics of countries and peoples in various parts of the world. It has hitherto been difficult to obtain

instructive films of this kind for exhibition except by applying to a number of different firms. The Macmillan Educational Film Co., Ltd., 32 Charing Cross, S.W.1, has now, however, made a collection of educational and scientific films which they are able to offer for hire. We have before us a list of such films relating to geographical, industrial, Nature-study, and other subjects, and a copy can be obtained by anyone upon application to the company. There are also lists of suggested programmes—one of a varied kind, and another in which geographical subjects are appropriately grouped together. It may be hoped that local education authorities will avail themselves of such assistance as is afforded by these lists to give a new character to cinematograph displays in local picture-houses. In the United States thousands of schools make use of the moving picture for educational purposes, and there is a great opportunity for its wise employment here when existing prejudices have been overcome.

## Societies and Academies.

### CAMBRIDGE.

**Philosophical Society**, November 22.—Prof. Seward, president, in the chair.—F. A. Potts: A note on vital staining. In studies which have been made on the penetration of neutral red into the living body of the soil nematode *Diplogaster* it is found that most of the stain makes its way through the mid-gut and none through the skin. In the mid-gut a zone of granules arranged peripherally round the lumen of the gut takes up the stain particularly.—W. F. Lanchester and A. G. Thacker: Preliminary note on the superior vena cava of the cat. Thirty cats were dissected to observe the point of entrance of the internal jugular, which in every case except one fell into the external jugular. Observations were also made on the length of the superior vena cava in twenty-one adult cats, and the length appeared to be varying round more than one mean.—Miss M. D. Haviland: Preliminary note on a Cynipid hyperparasite of Aphides. *Charips* (Cynipidæ) is a hyperparasite of Aphides through *Aphidius* (Braconidæ). The female pierces the *Aphidius* larva while the latter is lying inside the living Aphid, and deposits an egg within its body. The first-stage larva of the Cynipid is hypermetamorphic, with a thick chitinous skin and tail, but during development, which takes place within the Aphidius, the larva gradually assumes the form usual among parasitic Hymenoptera. Shortly before metamorphosis the hyperparasite leaves its host, the remains of which it devours, and its tracheal system becomes functional. It afterwards pupates within the cocoon previously woven by the Braconid.—Dr. E. H. Hankin and F. Handley Page: The problem of soaring flight (see p. 518).—Sir George Greenhill and Dr. G. T. Bennett: The rotation of a non-spinning gyrostator.—E. V. Appleton: A method of testing triode vacuum tubes. A dynamic method of measuring the slope of the principal voltage-current characteristic of a three-electrode thermionic tube is described.—W. B. Frankland: The astronomical bearing of the Einstein theory.—Dr. W. Burnside: The representation of the simple group of order 660 as a group of linear substitutions on five symbols. Except in the cases of two and of three variables, the explicit forms of groups of linear substitutions have been given only in a few cases. Thus it is hoped that the explicit forms in the case referred to may be of interest. The existence of a cubic three-spread, in space of four dimensions, admitting a group of

660 collineations into itself may be compared with the more familiar case of Segre's cubic three-spread which admits a group of 720 such collineations.

### MANCHESTER.

**Literary and Philosophical Society**, November 2.—Sir Henry A. Miers, president, in the chair.—Dr. W. J. Walker: The polytropic curve and its relation to thermodynamic efficiency (with a note on the theory of the uniflow steam-engine). An inquiry made into the reason for the diminution of internal-combustion engine efficiencies when the value of  $n$  in the equation,  $p v^n = \text{constant}$ , for the compression line is reduced by water injection or other means.—W. H. Pearson: Notes on a collection of Hepatics from the Cameroons, West Coast of Africa. The collection, made by Mr. W. G. Travis from logs of ebony in the Liverpool docks, contained the following species: *Aneura Travisiana*, n.sp., Pears.; *Lophocolea Newtoni*, St.; *Mastigolejeunea* . . . ?; *Homalolejeunea excavata* (Mitt.), Sp.; *Ceratolejeunea Saxbyi*, n.sp., Pears.; and *Cheilolejeunea Principensis*, St. The type-specimens are in the Manchester Museum.

### SHEFFIELD.

**Faraday Society and Institute of Metals (Sheffield Section)**, November 19.—Afternoon session, Prof. C. H. Desch in the chair.—Dr. L. Aitchison: Electroplating for the prevention of corrosion. The paper dealt more especially with the protection of iron and steel and their alloys. The conditions for proper protective coatings were defined and the value of the various protective coatings was discussed with relation thereto.—W. A. Thain: Some applications of electro-deposition in aeronautical engineering. Three cases of the electro-deposition of copper were considered, viz.: (1) As a protection against carburisation in case-hardening practice; (2) as a means of increasing heat conductivity; and (3) as a means of building up a definite constructional detail.—B. Carr: The electro-deposition of cobalt. From a bath containing  $4\frac{1}{2}$  lb. of cobalt sulphate crystals,  $5\frac{1}{2}$  oz. of boric acid, and  $2\frac{1}{2}$  oz. of sodium chloride per gallon, and used at  $34^\circ$  C., excellent hard, adherent deposits of cobalt were obtained, provided that these were not too thick, with 150 and 72 amperes per sq. ft. for periods of immersion not exceeding 2 and 4 minutes respectively. The deposit is exceedingly resistant to atmospheric corrosion, and superior to nickel in the rapidity of deposition and hardness.—W. E. Hughes: The use of colloids in the electro-deposition of metals.—S. Field: The commercial electrolysis of zinc sulphate solutions. Commercial electrolysis aims at the maximum extraction of zinc with a minimum of energy. The greater the extraction the smaller the volume of liquor which circulates through the extraction plant, and the smaller the proportion of zinc which demands repeated purification. A limit to this extraction is set by the cost of increased energy necessary to take out zinc from dilute liquors. Current efficiency is dependent upon a number of factors, including current density, amount of zinc present, temperature, and the presence of impurities.

Evening session, Mr. E. A. Smith in the chair.—W. R. Barclay: Electro-silver plating and its technical development. This paper dealt with the history of technical investigation and research into the electro-deposition of silver so far as the more practical aspect of electro-plating is concerned. Emphasis was laid on the necessity for careful co-ordination of the factors of metal and free cyanide content to that of current density. It was shown that though considerable latitude is allowable in practice, the best results and highest efficiency lie within fairly well