

sanction of the City Council. The estimated cost, apart from the final equipment, amounts to £80,000.

THE syllabus of lectures at the British Institute of Preventive Medicine, for the Session 1896-97, has just been issued, and contains particulars as to the work in the following departments:—Bacteriology: (1) Bacteriology in relation to Medicine and Pathology; (2) Bacteriology in relation to Hygiene; (3) Biological Chemistry; (4) Original Research Work: Hygiene, Clinical Investigation, Bacteriology of Fermentation, Water Laboratory, and Photomicrography.

THE following appointments have recently been made at the Swansea Technical School:—Lecturer in Metallurgy, Allan Gibb, Honours Associate in Metallurgy of the Royal College of Science. Lecturer in Physics, W. Williams, B.Sc. (London), Senior Demonstrator, Physical Department, Royal College of Science. Lecturer in Engineering, T. Gilbert Jones, B.Sc. (Vict.), Wh.Sc., &c., Lecturer in Applied Mechanics and Steam, Huddersfield Technical School.

AMONG recent appointments abroad we notice the following:—Prof. Thomas A. Williams, of South Dakota, to be Assistant in the Division of Agrostology of the Department of Agriculture; Mr. F. S. Earle, to be Professor of Biology at the Alabama Polytechnic Institute; Dr. Karl Rümker, to be full Professor of Agriculture in the University of Breslau; Dr. F. W. Küster, to be Professor of Physical Chemistry in the University of Göttingen; Dr. Wm. Sandmeyer, to be Professor of Physiology in the University of Marburg; Dr. Max Fischer, to be Professor at the Agricultural Institute at Leipzig; Dr. Richard Lorenz, to be Professor of Electro-chemistry at the Polytechnic Institute at Zürich; Herr Troske, to be Professor of Engineering at the Technical High School, Hanover; Dr. J. Biehringer, to be Docent in General and Technical Chemistry at the Technical High School, Braunschweig; Dr. Benecke, to be Docent in Botany in the University of Strasburg.

THE *Calendar* of the People's Palace, East London, Technical College for the Session 1896-7, contains information concerning all the classes which are to be held next winter, and their name seems to be legion. Not only can the student of pure science receive instruction in any branch from thoroughly competent teachers, but also the person desirous of help in learning how to make artificial flowers for bonnets, or how to cut out a coat. We fancy it would be difficult to name a subject which does not come within the syllabus of this technical school. We refer the students of East London to the *Calendar* itself for information concerning scholarships, exhibitions, fees, &c.

THE City of London College, Moorfields, has issued its list of classes to be held during the forthcoming session, and a very full syllabus of lectures proposed to be given in the Engineering Laboratory of the same establishment has reached us.

PARTICULARS of the technical instruction lectures and classes organised by the British Horological Institute, Northampton Square, London, E.C., have been published for the session, which commences on September 8. They include drawing and theory classes held at the Institute on Tuesday and Thursday evenings, or instruction in theory by correspondence. Ordinary and honours theory examinations, held at the end of April in each year, are opened to all engaged in the horological trades. Certificates are issued to watch and clock repairers who satisfy the examiners of their proficiency. The certificates will be of two classes, both for watches and clocks: an ordinary and an honours certificate. Practical examinations in new work will be held annually in April, and the silver medal of the Institute will be awarded to recipients of the honours theory certificate and the practical certificate for new work, who obtain the largest aggregate number of marks in both examinations.

THE Aberdeen County Council, says *Education*, is making careful inquiry at various fishing centres as to the extent to which the County Councils in England have provided technical instruction for fishermen. The Cornwall County Council spends between £500 and £600 per annum on this branch of their work, and they have appointed a lecturer to give instruction on the curing of herring and pilchards; the natural history of crabs and lobsters, mackerel, oysters, and salmon; the making of crab-pots, splicing and net repairing, and so on; and to supervise demonstrations on oyster and lobster culture at Falmouth. Instruction is also provided in the subject of navigation, with a

view to the examinations of the Board of Trade. The Essex County Council have started a marine biological station at Brightlingsea, to give practical instruction in the natural history of food fishes and other creatures. Experiments are also conducted in oyster culture, and lectures and demonstrations are given at the station. In Lancashire and Northumberland instruction has been given on the natural history of fish and navigation. At the conference, which was held last December, the proposal was put forward that a few practical fishermen should be selected from different centres in Aberdeenshire, and enabled to visit the more important fishing centres with a view to acquiring, and afterwards extending, a knowledge of the different methods of fishing, the treatment of fish after capture, preservation, and so on.

THE Department of Science and Art has issued the following lists of Scholarships and Exhibitions just awarded:—Whitworth Scholarships (tenable for three years), £125 a year each: Frederick C. Lea (24), engineer; William A. Taylor (23), engineer; Henry T. Davidge (24), engineer; John W. Hinchley (25), student (formerly engineer). Whitworth Exhibitions (tenable for one year), £50 each: William Du Bois Duddell (23), engineering student; John A. Sloan (23), engineer; Alfred J. White (20), engine-fitter apprentice; Hugh Wallace (21), engineering student; Edward A. Gere (22), student; Frank W. Arnold (23), engineering teacher; Hugh B. Phillimore (22), electrical engineer; Hanson Topham (19), mechanic; Harry E. Wimperis (19), engineer; Charles E. Handy (19), engine-fitter apprentice; Bertram J. Rouse (22), engine fitter; Frank H. Corson (19), fitter apprentice; Thomas G. Procter (20), engineering student; Harry Geldart (21), mechanic; Hector H. Garratt (20), engineer apprentice; George Wall (22), engineering student; George W. Howe (20), electrical engineer apprentice; William W. Firtli (21), engineering student; Harry Grute (22), fitter; Hugh J. Williams (23), turner; Frank Mould (24), engine fitter; Frank H. Jeffree (22), engineer; Denys Walton (19), engineer apprentice; Allan J. Grant (20), engineer; William G. Hibbins (24), engineer; Joseph P. Ward (21), engineer; George L. Overton (21), student; Asa Binns (22), fitter; Albert Pidgen (23), fitter; William P. Ferguson (21), fitter.

THE list of successful candidates for Royal Exhibitions, National Scholarships, and Free Studentships (Science) is as follows:—National Scholarships for Mechanics: Ernest Larmuth (17), student; Raymond B. Smith (17), engineering student; John B. Shaw (22), engineer; Frederick J. Tyler (22), engineer apprentice. National Scholarships for Chemistry and Physics: Henry L. Heathcote (19), student; James M. McEwen (17), solicitor's clerk; Arthur Hopwood (21), hatter; Percy Hughes (18), laboratory assistant; Sydney W. Smith (18), student. National Scholarships for Biological Subjects: Herbert Wright (21), weaver; Wilfred Thomas (20), laboratory assistant. National Scholarships: Alfred J. White (20), engine-fitter apprentice; James Walker (23), engineer; John Cresswell (19), student; Ernest W. J. Edwards (17), assistant demonstrator of physics; Archie McDougall (17), laboratory assistant; Frank E. Smith (19), laboratory assistant; George J. Fenwick (17), scholar; Hugh McDougall (19), laboratory assistant; Frank W. Arnold (23), engineering science teacher; Hanson Topham (19), mechanic; Harry E. Wimperis (19), engineer. Royal Exhibitions: William Alexander (20), engineer apprentice; William Scholes (16), student; Thomas G. Madgwick (18), engineering student; William Robertson (19), laboratory assistant; Charles E. Handy (19), engine-fitter apprentice; William Pickering (22), stonemason; George A. Robertson (22), engineering student. Free Studentships: Frank Jowett (18), student; Percy Kenyon (17), student; George W. Howe (20), electrical engineer apprentice; Frank Mould (24), engine-fitter; Philip G. Gundry (18), student; Allan Macdiarmid (22), student.

SCIENTIFIC SERIAL.

American Journal of Mathematics, vol. xviii. No. 3. (Baltimore, July.)—On the multiplication and involution of semi-convergent series, by Prof. Cajori. In vol. xv. Prof. Cajori has generalised Voss's results (*Math. Ann.*, vol. xxiv. p. 42), and some further contributions of his to this difficult subject are given in the *Bulletin* of the Am. Math. Soc. (vol. i. pp. 180-183). The search, he

remarks, for expeditious tests on the applicability of Cauchy's multiplication rule to powers of semi-convergent series higher than the second power, has given rise to the present investigation, which begins with alternating semi-convergent series, and ends with certain trigonometric series.—Analytic functions suitable to represent substitutions, is an interesting following-up of a theorem due to Hermite (*Comptes rendus*, vol. lvii. p. 750), by L. E. Dickson. Further generalisations are promised in a dissertation by the author.—S. Kantor contributes an elaborate memoir, "Theorie der Transformationen im R_n , welche sich aus quadratischen zusammensetzen lassen," which has as heading, "Boldness is caution in these circumstances."—Tactical Memoranda, i.-iii., by E. H. Moore, is the opening one of a series of papers which the author proposes to publish, on certain more or less closely connected topics of tactic. He starts from Cayley's division of algebra into tactic and logistic. This instalment bears upon the work of Reze (*Geometrie der Lage*), S. Kantor, Klein, and many others; it also gives a generalisation of the *fifteen-schoolgirls* arrangement, and considers whist tournament arrangements, which are in ultimate formulation purely tactical.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, August 17.—M. Marey in the chair.—On the copper mines of Sinai, worked by the ancient Egyptians, by M. Berthelot. These mines are near the coast of the Gulf of Suez, and are undoubtedly the most ancient known to history, having been worked at least 5000 years before the Christian era. They were abandoned about 3000 years ago, on account of the small amount of copper present in the ores. The reduction appears to have been carried out by methods not differing essentially from those in use at the present day, wood being used as the reducing agent, together with fusible silicates.—On the subject of a preceding communication, relating to some properties of primitive roots and secondary roots of prime numbers, by M. de Jonquières.—On an apparatus for aerial navigation, by M. Honoré.—Abstract of solar observations made at the Royal Observatory of the Roman College during the first half of 1896, by M. P. Tacchini.—Combination of argon with water, by M. P. Villard. When argon is compressed to 150 atmospheres in the presence of water cooled to 0° , local cooling at a point in the tube causes the separation of crystals, probably a hydrate, the dissociation tension of which at 0° is 105 atmospheres. Nitrogen and oxygen also combine with water under similar conditions, but at much higher pressures.—On the reticular structure of central nervous cells, by Mdlle. Wanda Sczawinska.—Contribution to the study of the coagulation of the blood, by MM. J. Athanasiu and J. Carvallo. It is concluded that in the normal state the blood and lymph contain elements, perhaps leucocytes, which supply the fibrin ferment necessary for the coagulation of these liquids, and that when these elements are prevented by any means, such as peptone, from fulfilling this function, the tissues are capable of replacing them.—Influence of certain substances upon the bactericidal properties of the blood, by M. London. The bactericidal power of the blood is markedly reduced by want of food, but increased by small repeated doses of sodium bicarbonate.—On the extraordinary refractions observed in the neighbourhood of lakes, and known under the name of *Fata Morgana*, by M. André Delebecque. The apparent enlargement of objects on the opposite bank of the lake is really due to the superposition of a number of images which, although not distinguishable by the unaided eye, are clearly separable by the aid of a telescope.—On the resolution of the general equation of the fifth degree, by M. L. Mirinny.

August 24.—M. A. Cornu in the chair.—M. Tisserand gave an account of the results of the observations made of the total eclipse of August 9. The results obtained by M. Deslandres at Yeso, and by Mdlle. Klumpke, at Vadsö, were unfavourable, but M. Backlund, of the Observatory of Pulkowa, was able to make some good observations at Novaya Zemlya.—On the transformations of the equations in dynamics, by M. Paul Painlevé.—On a proposition in mechanics, by M. F. Siacci.—On a doubly recurring series of points always homocyclic, by M. P. Serret.—On the electric convection following the lines of force produced by the Röntgen rays, by M. Aug. Righi. Experiments are described which tend to show the existence of a

convection following the lines of force.—The utility in radiography of a screen coated with phosphorescent sulphide of zinc, by M. C. Henry. The zinc sulphide screen, wrapped in carbon paper, is covered with the object to be examined and exposed to the radiation of a Crookes' tube for some minutes. On removal to a darkened room the image shines for at least a quarter of an hour, so that the smallest details of the image can be made out. The light emitted by glow-worms was found to be capable of penetrating blackened paper, and affecting a sensitive plate underneath.—The quaternary beds of the Micoque, by MM. G. Chauvet and E. Rivière.—Note on magnesium sulphide, by M. N. Bignan.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—British Association, Liverpool, 1896: Handbook to Liverpool, &c. (Philip).—An Archæological Survey of the United Kingdom: Dr. D. Murray (Glasgow, MacLehose).—On the Adjustment and Testing of Telescopic Objectives, 2nd edition (York, T. Cooke).—The Principles of the Transformer: Dr. F. Bedell (Macmillan).—"Made in Germany": E. E. Williams, 3rd edition (Heinemann).—Entomological Notes for the Young Collector: W. A. Morley (E. Stock).—British Butterflies: J. W. Tutt (Gill).—Elements of Astronomy: Sir R. S. Ball, new edition (Longmans). PAMPHLETS.—Les Applications de L'Electrolyse a la Metallurgie: M. U. Le Verrier (Paris, Gauthier-Villars).—Vierter Jahres-Bericht des Somblick-Vereines, 1895 (Wien).—Arithmetic for Promotion, Scheme B: Lock and Macdonald, Part 5 (Macmillan). SERIALS.—Science Progress, August (Scientific Press).—Royal Natural History, Part 34 (Warne).—Strand Magazine, August (Newnes).—Journal of the Royal Microscopical Society, August (Williams and Norgate).—Quarterly Journal of Microscopical Science, August (Churchill).—Longman's Magazine, September (Longmans).—Good Words, September (Isbister).—Sunday Magazine, September (Isbister).—Lloyd's Natural History. British Birds: Dr. R. B. Sharpe, Parts 3 and 4 (Lloyd).—Humanitarian, September (Hutchinson).—Chambers's Journal, September (Chambers).—Scribner's Magazine, September (Low).—Natural Science, September (Page).—Journal of the Royal Horticultural Society, Vol. xx. Part 1 (Victoria Street).—History of Mankind: F. Ratzel, translated, Part xi. (Macmillan).—Modern Astrology, September (Bouverie Street).

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