

co-operation of Herschel, Brewster, Powell and other distinguished men. He was also well known as a lecturer, and on June 21, 1834, he lectured to a crowded audience in the theatre of the Mechanics' Institution on Babbage's calculating machine, to the cost of which the Government had contributed largely, but the construction of which was then at a standstill. Lardner dealt with the history and the principles of calculating machines and referred to their importance for the construction of correct mathematical tables. In its report of the lecture, the *Times* said that it would be considered a matter of national concern if means were withheld for the completion of Babbage's machine. The occasion was rendered notable by the presence in the chair of Lord Brougham and the attendance of M. A. Dupin, the president of the French Chamber of Deputies, whom the Committee of Management elected an honorary member of the Institution. M. Dupin was the brother of Baron Charles Dupin (1784-1873), the mathematician who had written on the manufactures and industries of England. In announcing M. Dupin's election, Dr. Birkbeck said he trusted, after what M. Dupin had heard that evening, that he would be induced to continue to lend his powerful aid and assistance to his brother in promoting the establishment of similar institutions to their own in France.

McCormick patents his Reaping Machine

There were many pioneers of the reaping machine but the outstanding inventor was Cyrus Hall McCormick (1809-84). His machine was exhibited at the Great Exhibition of 1837 and the *Times* said of it that "if it fulfilled its promise, [it] was worth the whole cost of the Exhibition". McCormick was the son of Robert McCormick (1780-1846) of "Walnut Grove" Farm, Virginia, a man of many interests who himself attempted but abandoned the task of constructing a reaping machine. At the age of twenty-two years, young McCormick, undaunted by his father's failures, took up the problem and in a year or two produced a machine which was tried with considerable success. "The fundamental principles in this reaper," a recent writer has said, "the divider, reel, straight reciprocating knife, fingers or guard, main wheel and gearing, and front-side draft traction, together with their peculiar combination, have proved essential to reaping machinery down to the present time." McCormick, faced with a rival in Obed Hussey, patented his important invention on June 21, 1834. He spent several years in perfecting it, but finding difficulty in getting his machines constructed, in 1847 founded a works at Chicago, then a small lake-side port. By 1851 he was building 1,000 machines a year and in 1857 constructed 23,000. The firm he founded is now the International Harvester Company. McCormick became very wealthy and many honours came to him, the Paris Academy of Sciences in 1879 electing him a foreign member "as having done more for agriculture than any other living man".

Magnetic Survey of the British Isles

In 1834 Capt. (afterwards Sir Edward) Sabine commenced, in conjunction with the Rev. Humphrey Lloyd and Capt. (afterwards Sir James) Ross, the first systematic magnetic survey ever made of the British Islands. The results were published in a series of reports to the British Association, commencing 1835, and the first observations (apart from

some preliminary tests of instruments) appear to have been made by Sabine at Limerick on June 21, 1834. The British Association report for 1835 contains a "Magnetic Chart of Ireland A.D. 1835". In 1836 Sabine, almost single-handed, extended the survey to Scotland and in 1837, with Lloyd, Ross and other collaborators, to England. The recording, plotting and combining of the observations to obtain the most probable mean results represent a very large undertaking.

The Overland Route to India

At a meeting of the Royal Geographical Society held on June 23, 1834, presided over by John Barrow, a paper was read "On the Manners of the Inhabitants of the Southern Coast of Arabia and Shores of the Red Sea, with Remarks on the Ancient and Modern Geography of that Quarter, and the Road through the Desert from Kosir to Kenah". This paper was communicated by James Bird, who had lately returned by that route from India. Bird had made the passage from Bombay to Aden, and thence to Jeddah and Kosir by a steam packet, and the interest in his account was heightened by the project of steam navigation to India having just been made the subject for a public inquiry.

Societies and Academies

LONDON

Royal Society, June 7. G. I. TAYLOR: (1) The mechanism of plastic deformation of crystals. Plastic strain is chiefly due to the sliding of one plane of atoms over its immediate neighbour in such a way that the perfect crystal structure is re-formed after each atomic jump. Slipping occurs over limited lengths of the slip plane, and this type of plastic strain necessarily gives rise to elastic stresses near the two dislocations which occur at the two ends of each of these lengths. The assumption that such dislocations will migrate through the crystal, owing perhaps to temperature agitation, under the influence of even the smallest shear stress, leads to a definite picture of the mechanics of plastic distortion. (2) The strength of rock salt. Experiment shows that plastic strain in rock salt is the main factor determining the strength of well annealed crystals. A recent theory of the strength of metals is applied to rock salt and shown to lead to a parabolic relationship between tensile stress and plastic strain. It is concluded that the strain in rock salt occurs in the crystalline parts of the structure where the crystal order is perfect, and that the strength is determined by the mean free path of the centres of dislocation. The latter, which is of the order of 10^{-4} cm., is determined by the distance apart of the faults and by the temperature. The theory therefore assigns a definite function to the faults in determining the strength of crystals irrespective of their actual crystallographic or atomic nature. C. A. BEEVERS and H. LIPSON: The crystal structure of copper sulphate pentahydrate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. The copper atoms lie on the special positions (000) and $(\frac{1}{2}, \frac{1}{2}, 0)$ and the sulphur upon the general position (0.01 0.29 0.64). Four of the waters are arranged in squares around the coppers, and two oxygens make with these approximate octahedra. The fifth water is not co-ordinated, but is in contact with two oxygens and two waters. All the waters show two oxygen bonds each, in accordance with recent ideas.

PARIS

Academy of Sciences, April 23 (*C.R.*, 198, 1465-1556).
 LOUIS ROY: Remarks on the construction of a standard of self-inductance. J. HAAG: The hypothesis of fibres. The elementary theory of elasticity supposes the elastic body to be composed of small independent parallel cylinders to each of which the formula of extension is applied. In general, this is inexact. The present paper discusses all the cases for which this hypothesis is rigorously correct. S. IKENO: Heredity of gynodioecia in *Petasites japonicus*. SYLVAIN WACHS: Linear systems of unilateral quaternion equations. W. MARGOULIS: The minimum of power consumed by flying machines. JULES GÉHÉNIAT: The tensor of polarisation. ADRIEN JAQUEROD: Classification of atomic masses. JEAN SAVARD: Compensation of the electronic energy and the energy of repulsion in the hydrogen molecule. TH. V. IONESCU and MLE. IONICA CERKEZ: A new method for amplifying and producing low-frequency oscillations. The apparatus described gives oscillating currents of 0.5-1 amp., with frequencies between 2 and 15,000 cycles a second. ION I. AGARBICEANU: The mean life of a spectroscopic term and width of the lines of the spectrum. GUILLIEN: The existence of the dimer O_4 in liquid oxygen. From evidence based on the ultra-violet absorption spectrum, the author concludes that liquid oxygen is a mixture of molecules of O_2 and O_4 . RENÉ AUDUBERT and JEAN ROULLEAU: The mechanism of the action of light on selenium electrolytic photocells. F. BOURION and E. ROUYER: Determination of the total hydration of lithium chloride ions. R. TREHIN: Complementary researches on the absorption spectra of sodium chloride in the ultra-violet. The absorption spectra show that there is a distinct difference between the nature of the absorbing particles in crystallised salt and in aqueous solution. Salt solutions in glycerol were also studied. MARCEL BALLAY: The electrolytic deposition of nickel in media with pH higher than 7.0. LÉON PIAUX: The Raman spectra of cyclopentanol, of some alcohols derived from cyclopentene and of 1-cyano-1-cyclopentene. A. MICHEL-LÉVY and H. MURAUOUR: Experiments in micropyrography. The luminous phenomena produced by the detonation of a priming explosive (lead azide) are due to the wave of shock and not to the expansion of gas which succeeds it. M. LEMARCHANDS and MLE. D. SAUNIER: The combinations of the metalloids and basic oxides. Description of the properties of the compound Ag_2OI_2 , prepared by the action of iodine in carbon tetrachloride solution on anhydrous silver oxide. PIERRE DUBOIS: The thermal decomposition of manganese salts in a current of air. H. PIED and MLE. M. FALINSKI. Neutral zirconium nitrate. Crystallised zirconium nitrate could not be prepared free from nitric acid, but the application of the method of Schreinemakers gave results which left no doubt as to the existence of the compound $Zr(NO_3)_4 \cdot 5H_2O$. MLE. SUZANNE HÉMAR: The blue basic carbonates of copper. GEORGES ARRAGON: The acetylation of sorbose in the presence of pyridine. The substitution of pyridine for zinc chloride in the acetylation of sorbose gives higher yields of the tetracetate. A. COLANI: The combinations of uranyl oxalate with oxalates of the alkaline earths. SÉBASTIEN SABETAY and LEON PALFRAY: The extension of Cannizzaro's reaction to fatty and aryl fatty aldehydes. A comparison of the authors' application of the Cannizzaro

reaction with the hydroxylamine method of determining aldehydes. MARIUS BADOUCHE: Researches on the dissociable organic oxides. Ethyl 1.1'.3'.triphenylrubene carboxylate, $C_{26}H_{23}.CO_2C_2H_5$: its dissociable oxide. EDMOND URION: Some reduction products of cyclopentenylformaldehyde. MME. GUAISNET-PILAUD: A third hydrate of phenylmethylethylbetaine and its conditions of formation. HENRI ERHART: The white earths of Lorraine, their origin, nature and natural use. G. LUCAS: Tectonic study of the north region of Medjana (Algeria). J. COULOMB: The beginning of Love waves. ROBERT LAMI: The heterogeneity of some physical characters of coastal basins. A. MÉTRAL: Clouds in bands. BOGDAN VARITCHAK: The formation of organs of sexual reproduction in a species of the genus *Saprolegnia* in cultures *in vitro*. The formation of the organs of sexual reproduction depends on the composition of the nutritive medium, its hydrogen ion concentration and temperature. FERNAND MOREAU and MLE. C. MORUZI: The sexual reactions between Ascomycetes of different species. H. S. REED and J. DUFRENOY: The histochemical detection of iron and zinc in the leaves of *Citrus*. The disease known as mottle leaf in *Citrus* is amenable to treatment of the soil with zinc salts. Micro-incineration of the leaves according to Policard's method, followed by microchemical analysis, shows the distribution of the zinc in the tissues. A. MAIGE: The physicochemical conditions of formation of the amylogen vacuoles in the plants. RAOUL LECOQ and JEAN SAVARE: The rôle of the food equilibrium in the utilisation of castor oil by the organism. H. BIERRY: The preparation of protein sugar. MME. YVONNE KHOUVINE: The synthesis of cellulose by *Acetobacter xylinum* starting with polyalcohols containing C_3 , C_4 , C_5 , C_6 and C_7 . G. WARCOLLIER, AUG. LE MOAL and J. TAVERNIER: The accidental presence of acrolein in cider brandy and pear brandy: its formation at the expense of the glycerol. N. STENDAL: The presence of a glycol in the wax of the tubercle bacillus. Description of the method of separation of a glycol, phytyglycol, $C_{26}H_{54}O_2$, the physical and chemical properties of which are given. MAURICE PIETTRE: Physicochemical phenomena accompanying the physiological stimulation of the breast in females before the first parturition. P. LEPINE and MLE. F. BILFINGER: The experimental infection of the louse by murin virus of the exanthematic type.

LENINGRAD

Academy of Sciences (*Comptes rendus*, n.s., No. 4).
 V. D. KUPRADZE: Integral equations for electromagnetic waves. V. GOGOLADZE: Cauchy's problem for a 'generalised' wave equation. A solution of Cauchy's problem is offered. V. KONDRATJEV and D. EROPKIN: Atmospheric band of water vapour 6324 Å. in the solar spectrum. In the interval 170 Å. of the solar spectrum, 235 new lines were found, 109 of them being of considerable intensity. As regards Rowland's lines, many of them proved to belong to water vapour. S. ARZYBYSHEV and A. TOPOREZ: A new method for the determination of mobility of metallic ions in alkali haloid crystals. N. DOBROTN: Angular distribution of protons ejected by neutrons. A calculation made for $F(\psi) = \cos \psi$ shows that the data obtained are nearer to Curie's results (*Phys. Rev.*, 44; 1933) than to those of Auger and Monod-Herzen (*C.R. Acad. Sci. Paris*, 196; 1933). P. LAZAREV, N. PODZOROV, E. JAKOVLEV and L. KUSMINTCH: Researches on

adaptations in peripheral vision during different stages of pregnancy. The visual sensibility becomes depressed a few days before the end of pregnancy, and the depression reaches its maximum during labour. After labour, the sensibility rises considerably. I. TCHERNAYEV and A. RUBINSTEIN: The reaction of pyridine with Cleve's and Gerard's salts. When pyridine reacts with Cleve's salt, a replacement of the molecules of ammonia by pyridine takes place, and $(\text{PyCl})_2\text{Cl}_2\text{Pt}$ is formed. In the reaction with Gerard's salt, pyridine replaces two ions of chlorine, with the formation of $(\text{NH}_3)_2(\text{PyCl})_2\text{PtCl}_2$. The reaction with pyridine may serve as a qualitative test for these salts. N. HELD and V. DJACHKOV: Studies in the adsorption of organic substances on crystal surfaces. The adsorption of nonylic acid on barium sulphate proved to belong to the type of ionic adsorption. A. STUDITSKII: The interaction of cartilaginous tissue and the periosteum and its rôle in the endochondrial process according to data obtained from grafts transplanted on to the allantois. V. NOVIKOV, A. GRECHUSHNIKOV and J. BARMENKOV: The accumulation of rubber in the roots of *tau-sagy* as a result of its disappearance from the leaves. B. LICHAREV: New genera of Upper Palaeozoic Brachiopoda. A. P. VINOGRADOV: Origin of iodine and bromine in oil-bearing waters. D. KOSTOV: Polygeneric hybrids experimentally produced. Experiments showed the possibility of obtaining trigeneric and tetrageneric hybrids of several species of *Nicotiana*.

Comptes rendus, n.s., No. 5.—I. VINOGRADOV: Trigonometrical polynomials for complicated moduli. S. BERNSTEIN: Diffusion with absorption. V. KUPRADZE: The proofs of existence and of unity in the diffraction theory. V. A. FOCK: Approximate representation of wave functions of penetrating orbits. V. KUZNETSOV and D. SARATOVKIN: Contribution to the problem of the primary crystallisation of metals. The orientation of monocrystals is accidental, and the probable orientation is characterised by the angles $\chi = 0^\circ$ and $\chi = 30^\circ$. P. BUDNIKOV: Activation of the slags of blast furnaces and the preparation of clinkerless cement. N. HELD and K. SAMOCHVALOV: Studies in the adsorption of organic substances on crystal surfaces (2). Influence of electrolytes on the adsorption of the octylalcohol by Ag_2S , HgS , BaSO_4 , and of the nonylic acid by Ag_2S . A. STUDITSKII: Conditions for the differentiation of the osseous tissue of a human embryo in grafts on the allantois. I. KOLOMIEZ: On 'critical period' in the development of wheat. There is a connexion between the greatest sensitivity of wheat to a lack of moisture, and the time at which the formation of the generative organs begins. L. DOBRUNOV: Growth peculiarities of hemp as a result of a lack of nutritive substances in the soil.

Forthcoming Events

Wednesday, June 20

ROYAL METEOROLOGICAL SOCIETY, at 5.—Sir Napier Shaw: "The Natural History of Weather".

I. S. Astapowitsch: "The Air-Waves caused by the Fall of the Meteorite on June 30, 1908, in Central Siberia". Dr. F. J. W. Whipple: "Phenomena related to the great Siberian Meteor".

INSTITUTION OF HEATING AND VENTILATING ENGINEERS, June 18-20. Summer meeting to be held at Hastings.

Official Publications Received

GREAT BRITAIN AND IRELAND

Air Ministry: Aeronautical Research Committee: Reports and Memoranda. No. 1557 (I.C.E. 823; T.V.C. 58): Effects of Friction in Airscrew Drives in Damping Torsional Vibration. By B. C. Carter. Pp. 25+3 plates. 1s. 3d. net. No. 1567 (Strut. 122, 127): Flexural and Shear Deflections of Metal Spars (Part 1). By I. J. Gerard and H. Boden. Pp. 11+20 plates. 1s. 6d. net. (London: H.M. Stationery Office.)

Proceedings of the Royal Irish Academy. Vol. 42, Section C, No. 3: A Wooden Cauldron from Altartate, Co. Monaghan. By A. Mahr. Pp. 11-29+plates 7-10. (Dublin: Hodges, Figgis and Co.; London: Williams and Norgate, Ltd.) 1s.

Seale-Hayne Agricultural College, Newton Abbot, Devon: Department of Plant Pathology. Tenth Annual Report for the Year ending September 30th, 1933. (Pamphlet No. 42.) Pp. 39. (Newton Abbot.)

A List of Official Chemical Appointments. Compiled by direction of the Council of the Institute of Chemistry and under the supervision of the Publications Committee. Eighth edition, revised and enlarged. Pp. 389. (London: Institute of Chemistry.) 5s.

The Scientific Journal of the Royal College of Science. Vol. 4: Containing Papers read during the Session 1933-1934 before the Imperial College Chemical Society, the Royal College of Science Natural History Society, the Royal College of Science Mathematical and Physical Society. Pp. 172. (London: Edward Arnold and Co.) 7s. 6d.

Annals of the Royal Statistical Society, 1834-1934. Pp. xii+308+8 plates. (London: Royal Statistical Society.)

A List of International Fellowships for Research. Second edition (revised and amplified). Pp. 187. (London: International Federation of University Women.) 2s.

Economic Advisory Council. Committee on Cattle Diseases: Report. (Cmd. 4591.) Pp. 161. (London: H.M. Stationery Office.) 2s. 6d. net.

OTHER COUNTRIES

Mysore Geological Department. Bulletin No. 14: The Origin and Correlation of the Metamorphic Rocks of the Sakarsanahalli Area, Kolar District. By M. B. Ramachandra Rao and K. Sripada Rao. Pp. iv+33+8 plates. (Bangalore: Government Press.) 1 rupee.

Dominion of Canada: Department of Marine: Radio Branch. Supplement "A" to Bulletin No. 2: Radio Inductive Interference. By H. O. Merriman. Pp. 41. (Ottawa: King's Printer.) 15 cents.

U.S. Department of the Interior: Geological Survey. Bulletin 846-D: Some Lode Deposits in the Northwestern Part of the Boise Basin, Idaho. By Clyde P. Ross. (Contributions to Economic Geology, 1933.) Pp. iv+239-285+plates 39-48. 35 cents. Bulletin 848: The Microscopic Determination of the Nonopaque Minerals. By Esper S. Larsen and Harry Berman. Second edition. Pp. vi+266. 20 cents. Water-Supply Paper 726: Surface Water Supply of the United States, 1932. Part 1: North Atlantic Slope Basins. Pp. x+378. 25 cents. (Washington, D.C.: Government Printing Office.)

Forest Bulletin No. 82: The Measurement of Standing Sample Trees. By H. G. Champion. Pp. iii+17+5 plates. (Delhi: Manager of Publications.) 1.2 rupees; 2s.

Koninklijk Vereeniging "Koloniaal Instituut", Amsterdam. Drie en twintigste Jaarverslag, 1933. Pp. 96. (Amsterdam.)

Smithsonian Miscellaneous Collections. Vol. 89, No. 13: A Systematic Classification for the Birds of the World, Revised and Amended. By Alexander Wetmore. (Publication 3242.) Pp. 11. Vol. 91, No. 9: Reports on the Collections obtained by the first Johnson-Smithsonian Deep-Sea Expedition to the Puerto Rican Deep—Three New Deep-water Fishes from the West Indies. By George S. Myers. (Publication 3238.) Pp. 12+1 plate. Vol. 91, No. 10: Reports on the Collections obtained by the first Johnson-Smithsonian Deep-Sea Expedition to the Puerto Rican Deep—New Brachiopods. By G. Arthur Cooper. (Publication 3241.) Pp. 5+2 plates. Vol. 91, No. 11: Reports on the Collections obtained by the first Johnson-Smithsonian Deep-Sea Expedition to the Puerto Rican Deep—Two New Nematodes. By B. G. Chitwood. (Publication 3243.) Pp. 4+1 plate. (Washington, D.C.: Smithsonian Institution.)

Chamber of Commerce of the State of New York. A Report of the Special Committee on Immigration and Alien Insane, submitting a Study on Immigration-Control. By Harry H. Laughlin. Pp. 51. (New York City.)

Bulletin of the Earthquake Research Institute, Tokyo Imperial University. Supplementary Vol. 1: Papers and Reports on the Tsunami of 1933 on the Sanriku Coast, Japan. Pp. xii+271+250+251 plates. (Tokyo: Iwanami Shoten.) 12.50 yen.

The Upper Winds of Hong Kong: from Observations made with Pilot Balloons, 1921-1932. By G. S. P. Heywood, under the direction of C. W. Jeffries. Pp. 13+18 plates. (Hong Kong: Royal Observatory.) 2 dollars.

Research Activities of the National Research Council, 1933-34. Pp. 59. (Ottawa.)

Department of Agriculture, Mauritius: Sugarcane Research Station. Bulletin No. 3: Some Preliminary Data concerning the Best Shape and Size of Plot for Field Experiments with Sugarcane. By Dr. H. Evans. Pp. 11+2 plates. (Port Louis: Government Printer.)

Publications of the Dominion Astrophysical Observatory, Victoria, B.C. Vol. 6, No. 9: Spectrophotometric Studies of Wolf Rayet Stars and Novae. By C. S. Beals. Pp. 95-148. Vol. 6, No. 10: The Radial Velocities of 477 Stars. By W. E. Harper. Pp. 151-202. Vol. 6, No. 11: The Spectroscopic Orbit of H.R. 8584. By W. E. Harper. Pp. 203-206. (Ottawa: King's Printer.)

The Indian Forest Records. Vol. 19, Part 9: Entomological Investigations on the Spike Disease of Sandal (19): On the Life-History and Morphology of *Petalcephala virgilinea* Walk., (*Jassidea*, Hompt.) By N. C. Chatterjee. Pp. iii+30+2 plates. (Delhi: Manager of Publications.) 12 annas; 1s. 3d.

The Tea Research Institute of Ceylon. Bulletin No. 11: Annual Report for the Year 1933. Pp. 75+2 plates. (Kandy.)