

## Societies and Academies

## LONDON

Royal Society, January 24. M. BORN and L. INFELD: On the quantisation of the new field equations. (1) The new field theory uses the primary field vectors  $\mathbf{E}$ ,  $\mathbf{B}$  and derives secondary field vectors  $\mathbf{D}$ ,  $\mathbf{H}$  by differentiating the Lagrangian  $L(\mathbf{E}, \mathbf{B})$  with respect to  $\mathbf{E}$ ,  $\mathbf{B}$ . If one gives up the invariant form (that is, the four-dimensional tensor notation), one can introduce other pairs of primary variables; in each case there exists an action function, one of which is the energy density. Using this representation it is possible to formulate the quantum laws of the field. The field equations can be written without any space or time derivatives, only by means of commutators connecting the field vectors with the total energy and the total momentum. They formulate a coherent unitarian quantum theory of matter and field. (2) The commutation rules for the field components are given in a new form which makes no use of  $\delta$ -functions. The behaviour of an electro-dynamical system as a whole is described by a set of integral quantities: total energy, total momentum, centre of energy, total angular momentum. These quantities satisfy commutation rules which can be derived from those for the field components. The chief result is that the co-ordinates of the centre and the components of the total momentum are connected by the same commutation laws as in quantum mechanics, and that the components of the momentum commute; but the co-ordinates of the centre do not commute. H. BETHE and R. PEIERLS: The scattering of neutrons by protons. The result is practically independent of the special law of force assumed between neutron and proton; it depends only upon the known binding energy of the dipion. The cross-section obtained is about 50 per cent larger than the rather uncertain experimental value. The scattering is almost isotropic (in the relative co-ordinate system) for neutron energies up to about 40 million volts.

## EDINBURGH

Royal Society, January 7. ESTHER LOWE: Anatomy of a marine copepod, *Calanus finmarchicus*, Günner. A muscular mechanism in the heart wall opens the aortic valve and closes the ostia during systole. Circulation is assisted by rhythmical movements of the pericardial floor, involving alternate contraction of two sets of muscles. A paired series of canals returns blood to the pericardium. A pair of giant fibres in the nerve cord, arising by a chiasma in the brain, give off branches supplying, alternately, the dorsal longitudinal trunk muscles, which determine direction, and the flexors of the swimming feet, which accomplish the darting movement. The system, evidently, constitutes the effector portion of an escape reflex. GERARD DE GEER: Dating of late-glacial clay varves in Scotland. A measurement by Dr. J. B. Simpson of varved clay exposed by the River Earn near Dunning, Perthshire, has been correlated with a series from Lyngby, near Copenhagen. According to this correlation, the Dunning section corresponds to an early stage in the gotiglacial sub-epoch of the Scandinavian ice-retreat, dating from about 13,000 years ago. J. WALTON: The fossil hollow trees of Arran and their branches, *Lepidophloios Wünschianus*, Carruthers. In 1865, Edward A. Wünsch, of Glasgow, made the interesting discovery that there were fossil trees in position of

growth in the Lower Carboniferous volcanic ash beds on the north-east coast of Arran in the Clyde. The new methods which are available for getting sections of fossil plants are such that there is almost no limit to the size of block of material from which a section may be prepared. The trees had partly decayed before preservation and the hollow trunks contain fragments of many different kinds of plants (for example, *Bothrodendron*, *Protocalamites*, *Lygin-orachis*), all very well preserved structurally. The trees themselves prove to belong to the genus *Lepidophloios*, a near ally of the better-known Carboniferous genus *Lepidodendron*. Only the bases of the trunks are preserved. In four examples the central core of wood is found, and from its structure something of the mode of growth of the original tree may be deduced. It is also evident that, like the nearest living representatives of this extinct genus, *Selaginella* and *Isoetes*, these gigantic trees developed from spores. By careful comparison of histological features, it has been possible to identify various sized branches and twigs found in the same beds as parts of the plant which possessed the large trunks. IAN SANDEMAN: The mathematical representation of the energy levels of the secondary spectrum of hydrogen (2). An analysis of the two states,  $1s2s^2\Sigma$  and  $1s2p^1\Sigma$ , of  $H_2$  is carried out on the basis of J. L. Dunham's solution of the wave-mechanics equation for the diatomic molecule. The consistency of the results indicates very little evidence of  $l$ -uncoupling for these states. Potential functions are obtained which indicate that the potential function of Morse is not applicable to the two states.

## PARIS

Academy of Sciences, December 26 (*C.R.*, 199, 1537-1694). The president announced the death of Willem de Sitter, *Correspondant* for the Section of Astronomy. JEAN CHARCOT: Notice on the works of M. de Gerlache. A. LACROIX: The discovery of tectites on the Ivory Coast. Description and analyses of three specimens of tectites from West Africa. H. DESLANDRES: A simple and general relation of the molecular spectrum to the electrons and rings of electrons of the constituent atoms. JULIEN COSTANTIN, JOSEPH BOUGET and JOSEPH MAGROU: New experiments on the germination of the seeds of the potato in the mountains (1934). Comparison of the results of the culture experiments in 1933 and 1934. HYACINTHE VINCENT: Streptococæmia and suppurating meningitis with streptococci. The action of antistreptococcus serum in these infectious states. The author considers that the value of his serum treatment is best tested on the most serious forms of streptococcal infection, septicæmia and suppurating meningo-cephalitis. Of 218 such cases, 180 were cured. CHARLES NICOLLE and PAUL GIROUD: The observation of the Tunisian epidemics of historic and murin typhus and the study of their virus, showing that these two diseases are separate. CHARLES CAMICHEL and LÉOPOLD ESCANDE: The linear elements produced by the movements of fluids in the interior of systems under pressure. J. SCHOKALSKY: The physical map of the north polar region. LÉON POMEY: The last theorem of Fermat (divisibility by 3 and 5). N. ARONSZAJN: The series of Dirichlet with exponents linearly independent. JULES SCHAUDER: Quasi-linear equations of the elliptic type with continued coefficients. M. GHERMANESCO: The exceptional surface of a system of integral functions. SILVIO MINETTI: Some points of the theory of functions.

HENRI MINEUR: Mechanical systems in which the parameters are functions of the time. HENRI PONCIN: The stable hydrodynamical configurations which allow surfaces of discontinuities for the densities. MARIUS AUBERT, PIERRE CLERGET and ROGER DUCHÊNE: Detonation in injection motors. Description of an arrangement permitting the kinematographic study of flame propagation in a cylinder with two jets. Simultaneous injection of alcohol with gas oil reduced detonation, and benzaldehyde showed an even more marked antidetonating effect. ANDRÉ DANJON: A new transit instrument. This new form requires no essential geometric linkage, the meridian being defined by an optical method. The instrument has been used for some months at the Strasbourg Observatory. The corrections given by zenithal and equatorial stars do not show the systematic deviations of some hundredths of a second found with transit instruments of the ordinary type. H. GROULLER: Photographic stellar photometry by the method of Ch. Fabry. The method proposed by Fabry in 1910 has been applied to an equatorial at the Lyons Observatory and a diagram is given showing the light curve of the variable star *RT Aurigae*. CHARLES BERTAUD: The spectrum of Nova Herculis. JEAN LAGRULA: Measurements of the intensity of gravity in northern Africa. P. LEJAY: The general characters of gravity along the southern coast of China. NICOLAS KRYLOFF and NICOLAS BOGOLUBOFF: The quasi-periodic solutions of the equations of non-linear mechanics. JEAN LOUIS DESTOUCHES: The centre of gravity in Dirac's mechanics. Application to photons, to spin and to the proton. MAX BORN and LÉOPOLD INFELD: The deduction of Dirac's wave equation starting from quantum electrodynamics. C. BUDEANU: The working of a deforming apparatus. Y. ROCARD: The transfers of modulation in the Heaviside layer. PIERRE JACQUINOT: The Zeeman effect of mercury and its perturbations. GEORGES ATHANASIU: Photo-voltaic batteries and photo-electric cells with boundary layer. PIERRE GABIANO: The natural and magnetic rotatory powers of pinene vapour. The specific rotatory power of pinene as vapour is identical with that of the liquid, but the magnetic rotatory power of this hydrocarbon as vapour is 0.77 that of the liquid. PIERRE AUGER and PAUL EHRENFEST: Ultra-penetrating corpuscles of the cosmic radiation. WILFRIED HELLER: The frequency of the rotation and vibration bands and the chemical activity of molecules in the gaseous state. A. PORTEVIN and D. SEFERIAN: The absorption of nitrogen by the fusion of iron in the arc, and the iron-nitrogen diagram. Description of the proportions of iron nitride formed under different conditions of heating. 0.25-0.4 per cent nitrogen is absorbed when iron is fused in the flame of atomic nitrogen. The results of micrographic, dilatometric and thermo-magnetic study of the specimens are given in diagram form.

(To be continued.)

#### ROME

Royal National Academy of the Lincei: Communications received during the vacation of 1934. G. A. CROCCO: The conception of 'focus' in the stability of aeroplanes. A. RUSSO: Elimination of nuclear substance and adhesion of the gametes in a ciliate, in relation to the agglutination in the fertilisation of Metazoa. S. SARANTOPOULOS: A theorem concerning the method by recurrence (complete induction). G. BELARDINELLI: A class of analytic functionals (1). N. MOISSEIEV: The curves defined

by a system of differential equations of the second order (2). Certain properties of the trajectories in Hill's problem of three bodies. Previous study of dynamic problems with two degrees of freedom revealed the existence, on the plane of motion, of a geometric locus of the points in which occurs contact of the trajectories with a given family of curves,  $f(x, y) = \text{constant}$ . This contact was not lower than the second order. Such a curve is now applied to the study of the properties of the trajectories in Hill's problem. (3) Concerning a method of studying the integral curves in the system of three differential equations of the second order. G. L. ANDRISSI: Measurements of double stars. Measurements made on a number of double stars from Burnham's "General Catalogue of Double Stars" (1906) by means of the 7-inch Cauchoix-Cavignato equatorial at the Campidoglio Observatory are recorded. A. G. BARBERI: Compounds intermediate to ferrocyanides and ferro-ammines. When treated with potassium cyanide, ferro-dipyridyl and ferro-phenanthroline compounds of the type  $[\text{FeB}_3]\text{X}_3$  ( $\text{B} = \alpha\alpha^1$ -dipyridyl or *o*-phenanthroline) yield ferrocyanide, with intermediate formation of compounds of the structure  $[\text{Fe} \begin{smallmatrix} \text{B}_3 \\ (\text{CN})_2 \end{smallmatrix}]$  and  $[\text{Fe} \begin{smallmatrix} \text{B}_3 \\ (\text{CN})_4 \end{smallmatrix}] \text{K}_2$ , containing either two or three molecules of water of crystallisation. G. SCAGLIARINI and M. RAGNO: Influence of temperature on the formation of additive compounds. In the cold, cobalt chloride and bromide react with pyridine, giving the compounds  $\text{CoCl}_2 \cdot 4\text{C}_5\text{H}_5\text{N}$  and  $\text{CoBr}_2 \cdot 4\text{C}_5\text{H}_5\text{N}$ . If, however, the solutions are kept for some hours at 70°-80°, the salts crystallising out contain only two molecules of pyridine per molecule of the cobalt salt. Other similar cases are recorded. CARMELA MANUNTA: Origin of the uric acid in the hibernating eggs of the silkworm. Experimental data confirm the hypothesis that this uric acid is derived largely, not from embryonal metabolism, but from the maternal blood.

#### VIENNA

Academy of Sciences, November 29. RICHILDE WAGNER: Admittance of radium emanation into the human body through the skin. The skin is slightly permeable to the emanation but this is, as a rule, not the chief means of access of the emanation to the organism from baths. MAX PESTEMER and BRUNO LITSCHAUER: Ultra-violet absorption of mustard oil and of the thiocyanate group. This absorption is determined mainly by the sulphur atom of the thiocyanate and isothiocyanate group. MAX PESTEMER and GERHARD SCHMIDT: Ultra-violet absorption of binary liquid mixtures (6): the system ethyl thiocyanate-hexane. The curves representing the extinction coefficients of these mixtures are positive in comparison with those calculated additively. PAULA BERNSTEIN: Ultra-violet absorption of the system aniline-*m*-cresol in ethanol. In 0.01 and 0.1 molar solutions, the extinctions of these mixtures are virtually additive, although an equi-molecular compound is formed; such compound apparently decomposes at the above dilutions. MAX PESTEMER and BRUNO LITSCHAUER: Ultra-violet absorption of the system acetone-benzene. In agreement with the results obtained for the system acetone-hexane, the extinction of the acetone is positive in comparison with the additive values for the mixtures. That of the benzene is, however, negative, probably owing to an inductive action of the polar acetone.