future the teaching should be of a more exact nature, and such as to make the scholars think for themselves about the ordinary affairs of the household. (2) That the time is arrived when it is absolutely necessary to introduce into girls' schools of all grades, and from the outset of the school course, simple but accurate experimental work dealing with domestic matters. (3) That the meeting notes with satisfaction the introduction into the Code of the Education Department of the new subject domestic science as tending to the promotion of the changes suggested in the two preceding resolutions.

A LONG article by Sir Philip Magnus, in the April number of the *National Review*, carries on the crusade in favour of an improved organisation of scientific education and opinion as a means to industrial progress. He does not counsel slavish imitation of German methods, but shows that the advance of German manufacturing industry is largely due to a full and generous recognition of the great part played by science in national progress. It is instructive to compare Germany and England by means of sentences taken from different parts of Sir Philip Magnus' article.

Germany.	*England.*
The recognition of the advantages of scientific and technical education characterises all classes of society in Germany, and none more than employers of labour engaged in productive and engineering industry.	Unfortunately, there is considerable doubt among certain classes of manufacturers, and even among engineers, as to the value of education in assisting industry; and, judging from the treatment in Parliament of all educational measures, it would seem that our legislators are still unconvinced of the economic importance of the subject.
Between the elementary school and the technical high school or university there is an intelligible and well-coordinated system, which gives unity to the entire system of education.	At present our schools are only *disjuncta membra* of what we hope may one day become a system.
Care is taken that the influence of the Minister of Instruction, and of those who advise him, shall penetrate into every small rural School Board.	There is no responsible authority to supervise or grade our several educational institutions, so as to bring them into organic relation with one another.

General Conclusions.—German education is superior to our own in its appliances (schools and their equipment), methods of instruction, and organisation. The instruction is also more closely adapted to the wants and requirements of the people.

SCIENTIFIC SERIALS.

Bulletin of the American Mathematical Society, March.—On certain methods of Sturm, and their application to the roots of Bessel's functions, by Prof. M. Bôcher. This is a paper read before the Society at its February meeting, of which the purpose is to call attention to Sturm's methods, rather than to elaborate the details of the theory of the roots of Bessel's functions. These methods, which appear to have been overlooked, are given by Sturm in *Liouville's Journal*, vol. i. p. 136, &c. In addition to the Professor's own work, the paper discusses two recent proofs of theorems, really contained in Sturm's article, given by Messrs. Porter (a graduate student at Harvard) and Van Vleck (*American Journal of Mathematics*, xix. p. 75).—Dr. G. A. Miller, in a paper read at the January meeting, continues his work on groups. The article is on the transitive substitution groups, whose orders are the products of three prime numbers.—Note on the integration of a uniformly convergent series through an infinite interval, by Prof. T. S. Fiske, was also read at the same meeting. It illustrates a communication by Prof. Osgood, which was published in the November number of the *Bulletin*.—Short notices follow, by Prof. F. Morley, of Dr. L. Huebner's "Ebene und Räumliche Geometrie des Masses," and, by Prof. E. W. Brown, of the scientific papers of John Couch Adams.—Some points of interest are brought forward in the usual notes.

IN the numbers of the *Journal of Botany* for February, March, and April, Messrs. W. and G. S. West continue their description of the Fresh-water Algæ collected by Welwitsch in Africa, comparatively new ground; a large number of new and beautiful forms, and several new genera, being described and delineated. Mr. I. H. Burrill commences an elaborate article on the fertilisation of spring flowers on the Yorkshire coast, containing the results of a long series of careful observations, the general conclusions from which will appear in a later number.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 11.—"The Comparative Physiology of the Suprarenal Capsules." By Swale Vincent, M.B. (Lond.), British Medical Association Research Scholar. Received February 18.

The conclusions arrived at are as follows:—

(1) The suprarenal capsule of the mammalia corresponds to two distinct glands in Elasmobranch fishes, the medulla corresponding *in structure and function* to the "paired segmental" suprarenal bodies ("medullary glands" they may be called), while the cortex corresponds to the interrenal body.

(2) In Teleosts the medulla appears to be unrepresented, the known suprarenal bodies ("corpuscles of Stannius") consisting entirely of cortical substance, and corresponding in structure, and most probably in function, to the interrenal body of Elasmobranchs.

(3) The same is most probably true of Ganoids, although I am guided here solely by histological evidence; I have not been able to obtain sufficient and suitable material for physiological investigation.

Thus it appears from these researches that two primary groups of the class *Pisces* (Teleosts and Ganoids) have no "medulla" but only "cortex." So far as I know, the only piece of work published on the physiology of the suprarenal capsules in fishes is that of Pettit (12). This observer has made out a true physiological compensatory hypertrophy of one suprarenal in the eel after the other one has been removed. This renders it probable (what indeed was suggested by histological appearances) that this "cortical gland" has a secreting function. Pettit looks upon this organ in the eel as the fundamental type of the suprarenal capsule, but it appears to me much more probable that it represents cortex alone.

Physical Society, April 9.—Mr. Shelford Bidwell in the chair.—Mr. T. A. Garrett read a paper on a nickel stress telephone. In conjunction with Mr. W. Lucas, the author has experimented upon telephones with nickel magnets. A magnetised nickel rod is wound with insulated wire, and is then fixed vertically by a clamp at its lower end. A wooden diaphragm is rigidly attached to the top of the rod in a horizontal plane. The rod just passes through the middle of the diaphragm, where it is fixed with sealing-wax. The diaphragm is entirely supported by the nickel rod. On speaking against the top of the diaphragm, variations of longitudinal pressure, and consequently of magnetisation, are produced in the nickel, and corresponding undulatory currents are induced in the surrounding coil. The nickel wire is sometimes magnetised by stroking it with a magnet, and sometimes by passing a current through the coil. A diaphragm of pine-wood gives better results than a metallic plate. The instrument does not work well as a "receiver"; an ordinary telephone is used for this latter purpose. The results obtained with a weakly-magnetised nickel rod are much better than those with a strongly-magnetised steel rod, indicating that the undulatory currents are due rather to magnetic variations arising from changes of stress than to the relative motions of the magnet and coil. Dr. S. P. Thompson said that, some years ago, he had worked with a somewhat similar apparatus, using it as a "receiver," with wires of nickel, cobalt, and iron. Cobalt gave the best results; the metallic strips in his experiments dipped into the solenoids without contact with them. This arrangement did not work well as a "transmitter," even when a battery was included in the circuit. In some cases the rods were cut into short lengths separated by brass. Mr. Boys asked how the nickel "stress" instrument compared in clearness and loudness with an ordinary telephone. Mr. Shelford Bidwell had tried a nickel telephone

with a mica diaphragm, depending not upon mechanical stress, but magnetic strain. It did not work well. Dr. Chree thought the "stress" telephone might possibly be improved by choosing the right strength of magnetic field. Mr. Appleyard said the arrangement was interesting historically, because it was, mechanically, almost identical with the original instrument used by Philip Reis as a "receiver." The authors had succeeded in getting it to work as a "transmitter." Their success was probably due to the rapidity with which the magnetisation of nickel responded to very small changes of stress or current. The Post Office electricians had tried to introduce nickel cores into relays, on account of its magnetic sensitiveness; the results, he believed, had not been very satisfactory. Mr. T. A. Garrett, in replying, said the "stress" telephone gave better articulation than an ordinary "watch" telephone, but the sounds were feebler. There seemed to be a field-strength proper to the instrument; he had noticed that the articulation was clearer with three cells than with six.—Mr. W. A. Price then read a paper on alternating currents in concentric conductors. This is a mathematical investigation of a proposed new form of submarine cable. The case is considered of two concentric conductors, interrupted alternately at different points throughout the whole length. In the mathematical treatment, the cable is supposed to be laid in a circular path, and successive charges of electricity are supposed to be applied at some point at the extremity of a diameter of the circle. Expressions are given for the amplitude of the periodic charges arriving at a point diametrically opposite to the first; and for the reduction in amplitude, throughout the whole length of the cable, of an applied E.M.F. The theory indicates that under no circumstances can the "speed" of a cable of the proposed form be greater than the "speed" of a cable of ordinary type. The author has experimented upon an artificial cable connected up to represent the proposed form. The "definition" of signals is considerably better than that obtained through an artificial cable of analogous "weight" and "length" connected up in the ordinary way. Within certain limits the "definition" continues to improve as the number of sections, or subdivisions, of the cable is increased.—Mr. Blakesley said he was sorry the result did not indicate a successful type of cable. He would have been inclined to predict that the amplitude would have decreased with the number of sections. If a number of condensers were joined in series, and one end was subjected to a periodic E.M.F., the amplitude would fall off inversely as the square of the distance. Mr. Price then exhibited a galvanometer support. The instrument was suspended from two india-rubber cords, attached at the top and bottom to cross-bars of metal, thus forming a rectangle. The cross-bars were provided with knife-edges in such a way as to compensate for unequal stretching of the india-rubber. Weights could be added, if necessary, to the support, so as to increase its inertia.—Mr. H. Garrett read a paper, communicated by Prof. W. B. Morton, on the effect of capacity on stationary electrical waves in wires. The author investigates the effect produced when a condenser is inserted at a point in the secondary circuit of the apparatus used by Blondlot for obtaining stationary electrical waves in wires. The positions of successive nodes are determined in the usual way, by a bridge, with a vacuum-tube indicator. When two opposite points of the parallel secondary wires are joined to the plates of a small air-condenser, the nodes approach the condenser on either side. The amount of the displacement of the nodes—that is to say, the extent of the shortening of the apparent half-wave-length—depends upon the position of the capacity along the wire. The effect is *nil* when the condenser is at a node, and a maximum when it is midway between two nodes. The state of affairs at a point of the circuit is obtained by summation of a series of separate disturbances due to the different direct and reflected trains. In obtaining a formula for the conditions of resonance, with which to compare the observations, the author adopts a method from Heaviside. It connects the frequency of oscillation, with the position and capacity of the condenser.—Mr. Shelford Bidwell proposed a vote of thanks to all the authors, and the meeting was adjourned until May 14.

Zoological Society, April 6.—Dr. W. T. Blanford, F.R.S., Vice-President, in the chair.—The Secretary exhibited, on behalf of Mr. A. J. Lawford Jones, a curious cinnamon-coloured variety of the blackbird (*Turdus merula*), which had been captured near Dorking, Surrey.—Prof. B. C. A. Windle and Mr. F. G. Parsons contributed the first part of a paper "On the Myology of the Terrestrial Carnivora," which dealt with the muscles of the head, neck, and fore-limb of eighty-three individuals.—A communication was read from Mr. C. S. Tomes, F.R.S., on the minute structure of the teeth of *Notoryctes*. An examination of its dentition had confirmed the view previously arrived at by other naturalists that this animal has affinities with the *Dasyuridæ* and *Didelphidæ*.—A communication was read from Mr. R. Lydekker, F.R.S., entitled "The Blue Bear of Tibet, with Notes on the Members of the *Ursus arctus* Group." The author described a mounted specimen in the British Museum, which he identified with the *Ursus pruinosus* of Blyth. He also made a survey of the other members of the *U. arctus* group, and came to the conclusion that, with the exception of the extinct *U. spelæus*, they should all be regarded as sub-species rather than species. As they are all structurally similar, they seem, in his opinion, to be merely local varieties and colour-phases of what is essentially one animal.—Mr. G. A. Boulenger, F.R.S., gave an account of the fresh-water fishes collected in Celebes by Drs. P. and F. Sarasin. The specimens obtained were referred to fourteen species, of which four were described as new, one of them forming the type of a new genus of *Atherinidæ*, proposed to be named *Telmatherina*.

EDINBURGH.

Mathematical Society, April 7.—Dr. Sprague, President, in the chair.—The following papers were read: (1) Certain expansions of x^n in hypergeometric series, Rev. F. H. Jackson; (2) the C. discriminant as an envelope, Mr. Jas. A. Macdonald; (3) the factorisation of $1 - 2x^n \cos \alpha + x^{2n}$, Prof. John Jack.

PARIS.

Academy of Sciences, April 5.—M. A. Chatin in the chair.—Periodic solutions and the principle of least action, by M. H. Poincaré.—Preparation of iron carbide by direct union of metal and carbon, by M. Henri Moissan (see p. 566).—On the Innucelleæ or Santalineæ, a subdivision of the Insemineæ, by M. Ph. van Tieghem. The entire group of the Santalineæ comprises fifteen genera, the distinguishing characteristics of which are given.—M. Radau was elected a member in the Section of Astronomy, in the place of the late M. Tisserand.—The Commissions were elected for judging the memoirs sent in for the Godard, Parkin, Barbier, Lallemand, Larrey, Bellion, Mège, Montyon (Experimental Physiology), La Caze (Physiology), and Martin-Damourette prizes for 1897.—On the accidents which may be produced by heating with hot air, by M. N. Gréhant. In several cases of accidents attributable to emanations from heated iron pipes, the air of the room was carefully examined for carbon monoxide. In nine cases out of ten, however, the results obtained were negative, carbon monoxide being clearly present (·04 per cent.) in one case only. Further experiments were then carried out to see whether the method of analysis adopted could detect the passage of carbon monoxide through the walls of an iron stove kept at a dull red heat. The presence of CO was clear, although the air collected contained only ·015 per cent. of the gas.—On a clockwork myodynamometer, by the same.—The drawings on the rocks of the La Mouthe Cave (Dordogne), by M. E. Rivière. The antiquity of the drawings is proved by the fact that they are in part covered by the clay which constitutes the floor of the cave. This clay contains the remains of several species of animals, all quaternary. Three of the drawings were of animals, one of which is undoubtedly a bison (*Bos priscus*). Another drawing represents a kind of hut. Other drawings have been partly exposed, the excavation of which is being proceeded with.—Letter addressed to M. Berthelot by Mr. H. Wilde, F.R.S., concerning the offer of 5500*l.* to be applied to founding an annual prize for a work on Astronomy, Physics, Chemistry, Mineralogy, Geology, or Mechanics.—On mechanical quadratures, by M. B. Baillaud.—On the general theory of surfaces, by M. A. Pellet.—On the deformation of certain paraboloids, and on the theorem of M. Weingarten, by M. Eugène Cosserat.—On linear partial differential equations of the second order with two variables, by M. Cotton.—On the properties of complete functions, by M. Desaint.—On the partial polarisation of radiations emitted by some luminous sources under the influence of the magnetic field, by MM. N. Egoroff and N. Géorgiewsky. The results of M. Zeeman on the polarisation of rays from luminous flames by the action of a strong magnetic field were confirmed and enlarged, as, without the use of a spectroscope, the partial rectilinear

polarisation of the rays from lithium, sodium, and potassium flames, and also the rays from sparks between magnesium electrodes, was proved. Sparks between electrodes of carbon, aluminium, mercury, zinc, bismuth, and iron showed no trace of polarisation with the same Savart analyser.—New cadmium lamp for the production of interference fringes, by M. Maurice Hamy. An improvement on the cadmium tubes used by Michelson in his determinations of the relations between the wave-lengths of light and the metre. No electrodes are carried through the glass, the ends being enclosed by brass caps with graphite packing, and the tube in use being kept at about 350°. The tubes will stand over twenty hours' use without losing any of their brilliancy.—Researches on nickel steels: metrological properties, by M. C. E. Guillaume. The remarkable property of some nickel steels of having a coefficient of expansion nearly equal to zero, naturally suggested the use of these alloys in the construction of measuring instruments. With a view of seeing how far their mechanical properties are suitable, a series of alloys containing from 5 to 45 per cent. of nickel was studied as regards densities and elastic properties.—On the nature of the several species of radiations produced by bodies under the influence of light, by M. Gustave Le Bon.—An induction oscillograph, by M. H. Abraham.—On the variation of the electric state of high regions of the atmosphere in fine weather, by M. G. Le Cadet. The electric field is weaker at altitudes above 1500 metres than on the surface of the earth.—On a new oxide of phosphorus, by M. A. Besson. Although PH_3 does not react upon pure $POCl_3$ at any temperature below the boiling-point of the latter, a reaction takes place if a little HBr is also present with the formation of a lower oxide of phosphorus, apparently P_2O. The same substance is obtained by heating $POCl_3$ and PH_4Br together in a sealed tube at 50°. The new oxide forms a yellowish-red powder, not changed by heating to 100°. The formula was deduced from the analysis of the powder, no evidence being produced, however, to show that this consists of one oxide only.—On metastannyl chloride, by M. R. Engel.—The action of a high temperature upon the sulphides of copper, bismuth, silver, tin, nickel, and cobalt, by M. A. Mourlot. At the temperature of the electric furnace, cupric sulphide is reduced to cuprous sulphide and metallic copper, bismuth and silver sulphides to the metals, tin sulphide to the stannous salt, nickel sulphide to a sub-sulphide Ni_2S. Cobalt sulphide does not give a corresponding salt.—Combinations of ammonia gas and methylamine with the haloid salts of lithium, by M. J. Bonnefoi.—Action of gallic and tannic acids upon some alkaloids, by M. Œchsner de Coninck.—Preparation of sodium carbide and sodium acetylide in the pure state, by M. Camille Matignon.—Observations concerning the temperature of freezing of milk, by M. J. Winter. A reply to MM. Bordas and Génin.—On the non-identity of lipases of different origins, by M. Hanriot.—Two preparations of lipase, the one from blood serum, the other from the pancreas of the dog, showed marked differences in their saponifying action upon butyrin under similar conditions.—Some properties of the ferment causing the decolorisation of wines, by M. P. Cazeneuve. It has been previously shown that the cause of decolorisation of wine (*la casse*) is an oxidising ferment, the action of which is completely prevented by the addition of a small quantity of sulphurous acid to the wine. In the present communication the action of this sulphurous acid is shown to be due to a specific action upon the oxydase, and not merely to its reducing action, since a much larger amount of formaldehyde did not prevent decolorisation.—On a new method of obtaining the essential perfume of flowers, by M. Jacques Passy.—Researches on the development of the archegonium in the Muscineæ, by M. L. A. Gayot.—The law of formation of the transversal valleys in the Eastern Alps, by M. Maurice Lugeon.—The influence of franklinisation upon the singing voice, by MM. A. Moutier and Granier.—The action of currents of high frequency upon the virulence of the streptococcus, by M. Louis Dubois. Cultures of streptococcus showed a marked diminution in virulence after being repeatedly exposed to the effects of a high frequency current.—Action of the X-rays upon the heart, by MM. Gaston Seguy and F. Quénisset. Prolonged exposure to the X-rays has in several cases caused violent and irregular palpitation of the heart.—On the actinomycosic form of the tuberculosis bacillus, by M.M. V. Babes and C. Levaditi.—Note on the grouping of the stars, by M. Delauney.—On an improvement for the production of acetylene from calcium carbide, by M. Lechappe.

DIARY OF SOCIETIES.

THURSDAY, APRIL 15.

LINNEAN SOCIETY, at 8.—On some New Irish Crustacea: A. O. Walker.—On Desmids from Singapore: W. and G. S. West.—Exhibition: Plants collected during Two Years' Residence in Franz Josef Land: H. Fisher.

GEOLOGISTS' ASSOCIATION (Charing Cross, S.E.R.), at 4.30.—Long Excursion to Walmer, St. Margaret's, Dover, Folkestone, and Romney Marsh. Directors: George Dowker, W. F. Gwinnell, Dr. A. W. Rowe, and C. Davies Sherborn.

TUESDAY, APRIL 20.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.

ROYAL VICTORIA HALL, at 8.30.—Africa up to Date: Prof. B. J. Malden.

WEDNESDAY, APRIL 21.

ROYAL METEOROLOGICAL SOCIETY, at 7.30.—The Relation between Cold Periods and Anticyclonic Conditions of Weather in England during Winter: W. H. Dines.—Sunspot Influence on the Weather of Western Europe; A. B. MacDowall.—The Use of Kites to obtain Meteorological Records in the Upper Air at Blue Hill Observatory, Mass., U.S.A.; A. Lawrence Rotch.

ROYAL MICROSCOPICAL SOCIETY, at 8.—Exhibition of Microscopical Entomological Specimens by F. Enoch.

THURSDAY, APRIL 22.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Recent Developments in Electric Traction Appliances: A. K. Baylor. (Continuation of Discussion.)

CAMERA CLUB, at 8.15.—Peeps into Nature's Secrets: R. Kearton.

SATURDAY, APRIL 24.

ROYAL BOTANIC SOCIETY, at 4.

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