

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 25.—Sir William Crookes, president, in the chair.—Prof. L. Hill and J. F. Twort: The effect of the depth of pulmonary ventilation on the oxygen in the venous blood of man.—J. Barcroft and Toyojiro Kato: The effect of functional activity upon the metabolism, blood flow, and exudation in organs. The organ studies have been skeletal muscle and the submaxillary gland. (1) The oxygen used by these organs not only increases during their activity but outlasts it by some hours. The curve of oxidation usually shows two maxima, the first during the period of activity, the second much later. (2) Water leaves the blood-vessels in much greater quantities during and after activity of the organs than before; a similar second maximum is sometimes seen in the case of the exudation. (3) In the case of muscle not all the exudation leaves the muscles as lymph. Of the right and left gastrocnemius muscles, the one which has been stimulated is heavier several hours after the stimulation, and of lower specific gravity than the unstimulated one. (4) The dilatation of the vessels of the organ outlasts the functional activity for two hours or more in the case of muscle which has been stimulated rhythmically for fifteen minutes. (5) The tenseness of the muscle caused by its distension with water would seem to be the physical basis of stiffness.—Miss D. Jordan Lloyd: The osmotic balance of skeletal muscle. In order to free the phenomena as far as possible from complications due to the formation of diffusion columns, a very small flat muscle—the sterno-cutaneous of the frog—was used. The results of experiments show that an oxygen-saturated muscle has an osmotic equivalent less than that of distilled water.—Dr. A. J. Ewart: The function of chlorophyll. Previous observations of the author have tended to support the theory that chlorophyll is a stage in photosynthesis. The present paper develops this idea further. By means of Wellstätter's methods of extraction and separation, chlorophyll, carotin, and xanthophyll were obtained in the pure state and used for the experiments. The following conclusions were reached:—(1) No peroxides, organic or inorganic, are produced during the photo-oxidation of chlorophyll, xanthophyll, and carotin. The oxidising effect of these latter substances on potassium iodide when they are undergoing oxidation in the light is due to the fact that in the presence of abundant oxygen they can act as oxidases, not only to themselves, but also to substances with which they may be in contact, such as hydriodic acid, litmus, or guaiacum. (2) Chlorophyll and xanthophyll decompose during photo-oxidation into (a) solids, and (b) a gas. The solids are colourless, waxy substances and hexose sugars. The gas is formaldehyde gas. With dry films in dry air free from CO₂ relatively more formaldehyde is produced and less sugar. (3) Carbon dioxide combines with chlorophyll, forming xanthophyll and a colourless waxy solid. The combination only takes place actively in the presence of water, and is accelerated by sunlight.—A. Compton: The influence of the hydrogen ion concentration upon the optimum temperature of a ferment.—M. Back, K. M. Cogan, and A. E. Towers: Functional oedema in frogs. If the gastrocnemius muscle of a frog be stimulated for fifteen minutes with forty induction shocks per minute it becomes heavier than the other. The difference in weight may amount to upwards of 20 per cent. of the weight of the muscle. The specific gravity falls correspondingly. This phenomenon may be noticed from fifteen minutes after the stimulation ceases to six hours. After sixteen hours the oedema has passed off.

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Physical Society, February 12.—Dr. A. Russell, vice-president, in the chair.—A. Campbell Swinton: A galvanic cell which reverses its polarity when illuminated. If two plates—one of zinc and the other of tinned copper coated on one surface with selenium and varnished with enamel over the remainder of its surface—are immersed in tap-water, the electric current through a galvanometer connected to the plates shows that in the dark the zinc is electro-positive to the selenium, while the result of light falling on the selenium is to increase the effect. If, however, instead of zinc, carbon or copper is employed for the non-coated plate, the interesting result is obtained that, while the selenium proves to be electro-positive to the carbon or copper in the dark, it immediately becomes electro-negative to carbon or copper the moment it is illuminated, this being easily shown by the deflections of the galvanometer in contrary directions as the light is turned on and off.—Prof. S. P. Thompson: On the criterion of steel suitable for permanent magnets. Whatever the form to be given to a permanent magnet, the prime requisites as to the quality of the steel are (1) large remanent magnetism ($\mathcal{I}_{rem.}$) and a high coercive (force \mathcal{H}_c). Since Hopkinson's determinations of 1885 it has been supposed that for the purpose of making permanent magnets the best material would be that for which both of these quantities and, consequently, their numerical product, should be as high as possible. Recently Mr. J. A. Mathews and, independently, Mr. J. R. Ashworth, have proposed to take the ratio $\mathcal{H}_c \div \mathcal{I}_{rem.}$ or $\mathcal{H}_c \div \mathcal{B}_{rem.}$, which only differs in scale as the criterion. To decide as to the suggestion to take the ratio instead of the product a table giving the values of \mathcal{H}_c , $\mathcal{I}_{rem.}$, $\mathcal{H}_c \div \mathcal{I}_{rem.}$ and $\mathcal{H}_c \times \mathcal{I}_{rem.}$ for a number of steels is given, and it is clearly shown that the use of the ratio as a criterion of magnetic usefulness leads to most absurd results. As an example, annealed manganese steel (almost non-magnetic) should, judging from the ratio, be six times as good as Remy steel, whereas in reality, for equality of pull, a magnet of manganese steel would require to be 312 times the weight of that made of Remy steel. The qualities requisite in an ideal steel for permanent magnets are indicated.—A. B. Wood and A. I. Steven: An investigation of the photographic effect of recoil atoms. The ionising, phosphorescent and photographic effects of the α -particles from a radio-active substance entirely cease when the particle still retains about 40 per cent. of its kinetic energy. It appears possible, therefore, that the recoil atoms from a radio-active source should be able to affect a photographic plate, for though the range of a recoil atom is only about 1/500th of that of the α -particle shot off from it, the ionising effect has been shown by Wertenstein and one of the authors to be 10 times as powerful over the corresponding range as that of the α -particle. Attempts have, therefore, been made to demonstrate this action in the case of the recoil atom from polonium, this substance being chosen on account of the inactive nature of the recoiling atom. Two distinct methods were employed: (1) The recoil atom was "absorbed"; (2) the difference of deflection of the α -particle and the recoil atom in a strong magnetic field was utilised in order to attempt to separate their effects. "Schumann" plates were used as being most easily penetrable, but in all cases the results were negative or inconclusive. This is probably due to the fact that the recoil atoms are not able to penetrate sufficiently deeply into the sensitive layer to render the grains developable.

Linnean Society, February 18.—Prof. E. B. Poulton, president, in the chair.—Harold Wager: The action of light upon chlorophyll. By making a film of chlorophyll upon paper and on glass, by floating an alcoholic solution, and allowing it to dry, the author was able to bleach a portion under strong sunlight, and covering a portion by black paper; when this was tested by Schiff's solution, the exposed, that is, the bleached portion, became pink, the unexposed portion showing no colour change. Another experiment was made by subjecting similarly bleached portions of chlorophyll to the action of potassium iodide, when the exposed parts turned reddish-blue, in consequence of the liberation of iodine, which acts upon the starch on the paper. The experiments clearly show that the decomposition of chlorophyll is accompanied by the formation of an aldehyde and of something able to oxidise the potassium iodide and to set free the iodine. Instead of alcoholic extract of chlorophyll we may use dried leaves, or chlorophyll expressed from leaves, or layers of *Euglena* or *algæ* spread over the paper. The reactions also take place inside a leaf, if the bleaching has been efficient. Thus if sunlight is condensed by a lens upon a living leaf of *Oxalis acetosella* containing plenty of starch, the chlorophyll is bleached in a small area, and if treated with Schiff's solution, a strong aldehyde reaction results; if tested with potassium iodide the said area becomes blue. It having been stated that formaldehyde is produced when chlorophyll is exposed to sunlight in the presence of carbon dioxide, an attempt was made to determine whether such was the case in the present series of experiments, but the author was not able to satisfy himself on this point, though several of the tests succeeded even with so small an amount as one-millionth of formaldehyde. Hydrogen peroxide had been suggested as the gaseous oxidising compound of chlorophyll, but the result of many varied tests showed that this was not so.

MANCHESTER.

Literary and Philosophical Society, February 9.—Mr. F. Nicholson, president, in the chair.—Dr. T. Graham Brown: Note on the physiology of "walking," with especial reference to its occurrence in the unborn foetus of the cat. The various reflexes have been examined in cat foetuses. The red nuclei seem to be capable of stimulation, and evoke their characteristic movements of the fore-limbs. The limb reflexes are very similar to those of the adult cat. The ipsilateral flexion-reflex and the contralateral extension-reflex have thus been observed. In the former reflex an extension rebound effect has been seen. Reflex inhibition may be observed on pitting one reflex against another. If the foetus is shelled out of the uterus without delay into warm physiological salt solution it may be regarded as still unborn. In these circumstances unmistakable movements of progression may be obtained on producing asphyxia by pressure upon the umbilical cord. They may sometimes appear to arise spontaneously. This observation shows that the mechanism for co-ordinate progression develops during intra-uterine life, and that the co-ordination of the mechanism is not conditioned after birth by a process of "learning." The observation also shows that the rhythmic activity may be evoked by the general stimulus of asphyxiation before it has been evoked or conditioned by any rhythmic self-generated peripheral stimuli such as those which play an important part in normal progression, but have been shown not to be its intrinsic factors. It thus also gives another demonstration of the similarity between the respiratory mechanism and that for progression.—Prof. G. Elliot Smith: The Darling Downs skull. Photographs were shown of a completely mineralised

human skull, which had been found near Warwick in the Darling Downs of Queensland, and was described by Profs. Edgeworth David and Wilson at the recent meeting of the British Association in Australia. This important discovery of the earliest human remains yet known in Australia seems to prove that Man reached Australia at a time when the great fossil marsupials were still living.

DUBLIN.

Royal Dublin Society, February 23.—Prof. Wm. Brown in the chair.—Prof. Grenville A. J. Cole: The mode of occurrence and origin of the orbicular granite of Mullaghderg, Co. Donagal. The structure and mineral characters of this rock were described by Dr. F. H. Hatch in 1888. A recent visit by the Geological Survey has enabled large specimens to be procured, the surfaces of which have been polished. The nucleus in several of the large spherulites is seen to be a flake of schistose rock. In most cases, however, it consists of granite, somewhat poorer in biotite than the granite which includes the spherulitic bodies. The very local occurrence of this orbicular rock as a variation on the general red granite of the district leads to the conclusion that the spherulitic bodies represent inclusions from the roof of Dalradian schists which once overlay the granite cauldron. Such inclusions may have fallen in from a cold portion of the roof and thus promoted a rapid crystallisation of oligoclase round about them by interaction of their constituents and those of the granite magma. Blocks of already cooled granite may have fallen back also from the roof of the dome, and may have supplied nuclei for spherulitic growth. The occurrence of granite round about schist-fragments, and surrounded by a zone of radial oligoclase, suggests, however, an interchange of material between the granite and the schists. Granitic material seems to have soaked in while more basic material moved outwards to form the radially crystalline zone. Experiments by Tenow and Benedicks and by Endell are referred to; but no explanation can be offered as to why orbicular structure is so rare a phenomenon.

EDINBURGH.

Royal Society, February 1.—Sir E. A. Schäfer, vice-president, in the chair.—Mrs. Rosalind Jones (*née* Crosse): Studies on periodicity in plant growth. Part ii. Correlation in root and shoot growth. In a former paper the fact of a four-days' periodicity in plant growth had been established; and in the present continuation the subject was further investigated. It was found that artificial changes in environment as regards heating and illumination did not affect the periodicity, and that there was correlation in the root and shoot growths.—Dr. J. Dawson: The histology of disseminated Sclerosis. This investigation, which had been partly outlined by the late Dr. Alexander Bruce, was based on an extended pathological observation disseminated sclerosis. This investigation, which had been studied largely by the method of serial sections stained by modern neuro-histological technique; and complete sections through the cerebral hemispheres, or large portions of the central nervous system, had been used to elucidate the distribution of the patches. Although no complete interpretation of the subject could be given, or no uniform conception of the process offered, certain conclusions were formulated, of which the following may be noted. The process underlying disseminated sclerosis is a sub-acute disseminated encephalo-myelitis, which terminates in areas of actual and complete sclerosis. There is overwhelming evidence that the great majority of the areas arise on the basis of an evolution through a stage of fat granule cell formation. There is much to favour the

view that true disseminated sclerosis is due to a specific morbid agent, the nature of which is quite unknown. Histological evidence suggests a soluble toxin, conveyed to the nervous tissues by the blood channel rather than by lymphatics. The fleeting early motor paralysis and psychical symptoms may be related to the presence of areas in association paths, their remission being possibly due to the linking up of other association paths, or their compensation to the opening up of new paths. Although approximate answers may be given to questions relating to the nature of the process, to its origin, and to certain aspects of the mode of action, we are still quite in the dark concerning the nature of the final causal agent, which determines a disease which, however variable the early symptoms, conceals its characteristic course only temporarily.

February 15.—Dr. Peach, vice-president, in the chair.—Dr. H. Rainy and Dr. J. W. Ballantyne: Skia-graphic researches in teratology. The paper dealt with the abnormal development of bones in the human foetus, and was illustrated by a number of X-ray photographs of these abnormalities. The facts brought forward opened up important questions in heredity, as well as in development.—Prof. J. Stephenson: (1) On *Haemonais laurentii*, a representative of a little-known genus of Naididæ; (2) on a rule of proportion observed in the Setæ of certain Naididæ; (3) on the sexual phase in certain of the Naididæ. An account was given in these connected papers of the various systems of organs and of the process of fission in this group of worms. A curious feature in two of the species described was the degeneration of the alimentary canal as the worm approached sexual maturity. Dr. F. R. Cowper Reed: The Ordovician and Silurian Brachiopoda of the Girvan District. In this elaborate memoir about 250 species and varieties were described, of which some seventy were new to science. The greater number of specimens described were from the collection made by Mrs. Robert Gray of Edinburgh, and with these were joined specimens from various museums in Great Britain. The local facies of the fauna were strongly marked; but many of the species, particularly those of Ordovician age, resembled American rather than European types. A characteristic feature was the limitation of distinctive species to successive stratigraphical horizons, a fact which suggested a more extended use of brachiopods for zonal purposes.

PARIS.

Academy of Sciences, February 15.—M. Ed. Perrier in the chair.—L. E. Bertin: The transport of marine mines by currents under the action of the ground-swell. The upward thrust on the mine due to hydrostatic pressure has been usually calculated from the value in water at rest. The alterations in the thrust due to an oscillatory motion of the water are calculated, and it is shown that to prevent the anchor being lifted its customary weight should be doubled.—C. Guichard: Surfaces such that the lines of curvature correspond on the primitive surface, and on the surface locus of the centres of the spheres osculating the lines of curvature of a series of the primitive surface.—Paul Vuillemin: The flower. A discussion of the flower in its relation to the leaves.—B. Jekhowsky: Observations of Delavan's comet, 1913f, made at the Observatory of Paris. Four positions given for January 8 and 11. The comet appeared as a rounded nebulosity of about 30" diameter with a semi-stellar nucleus. Magnitude 7.5 to 8. No tail.—M. Alezais: A property of arithmetical progressions.—M. Globa-Mikhailenko: Ellipsoidal figures of equilibrium of a fluid mass in

rotation when capillary pressure is taken into account. It is shown that the only ellipsoidal figure of equilibrium assumed by a fluid mass in rotation, if the surface tension is taken into account, is the cylinder of revolution.—A. Guillet: Wheel with harmonic teeth, application to the construction of a laboratory chronometer with a uniform and continuous movement.—E. Mathias, H. Kamerlingh Onnes, and C. A. Crommelin: The rectilinear diameter of nitrogen. The densities of liquid nitrogen and its saturated vapour were determined at temperatures ranging from -208.36° C. to -148.08° C., and the values of the ordinate of the diameter were found to be $\gamma=0.022904-0.0019577\theta$. The angular coefficient of the diameter is $\alpha=-0.0019577$, and the critical density $\Delta=0.31096$. The critical coefficient $\frac{R\theta\Delta}{\pi}$ is 3.421, or nearly the same

as argon (3.424) and oxygen (3.419).—L. Bouchet: The deformation of vulcanised indiarubber under the action of an electrostatic field. The variable electrostatic pressures are sufficient to account for the observed facts without any additional hypothesis.—Kevin Burns: Interferential measurements of wave-lengths in the ultra-violet part of the iron spectrum. Data are given for wave-lengths between 2851 and 3701 on the basis of the value 6438.4696 for the red cadmium line.—Henry Hubert: Preliminary sketch of the geology of the Ivory Coast.—B. Galitzine: The earthquake in Italy on January 13, 1915. Particulars of the records on the seismographs at the Pulkovo Observatory. The position of the epicentre calculated from the seismograms coincided very closely with the region of greatest damage, and it is pointed out that observations from a single station were sufficient for this determination.—Ph. Flajolet: Disturbances of the magnetic declination at Lyons (Saint-Genis-Laval) during the second quarter of 1914.—Henri Coupin: A marine yeast. The first example of a yeast isolated from sea water, for which the name *Torula marina* is proposed.—M. Coquidé: Remark on the nitrification in the peaty soils in the neighbourhood of Laon. The experiments were made on virgin soil and included the addition of potassium chloride or kainit, sodium nitrate, and phosphate slag, the three types being used separately, in pairs, or all together, the last giving the best results. The effect of omitting nitrate was marked, and there appears to be little or no natural nitrification of the nitrogenous material in these soils.—J. Bergonié: The mobilisation in the tissues of magnetic projectiles by the repeated application of electromagnetism. To move deeply-seated metallic fragments repeated applications of an electromagnet may be required, leading ultimately to a swelling on the surface exactly localising the fragment, and permitting its easy extraction by a simple operation. Details of cases are given in which the original position of the piece of shell was too deep-seated for direct removal, or in which unsuccessful operations after X-ray localisation had been made.—Raoul Bayeux: The treatment of hydrarthrosis and hæmarthrosis by intra-articular pneumatic compression by means of oxygen.—A. Pezard: The experimental transformation of the secondary sexual characters in the Gallinaceæ.—A. Sartory, L. Spillmann, and Ph. Lasseur: Contribution to the study of typhoid states. Although the causal origin of typhoid fever is the Eberth bacillus, it appears to be probable that the pathogenic power of this organism may be increased by the presence of other micro-organisms, such as *Proteus vulgaris*, a diplococcus described by the authors, and possibly other pathogenic species. It is also possible that life in the trenches may give rise to a new clinical type of typhoid fever.

February 22.—M. Ed. Perrier in the chair.—The president announced the death of E. H. Amagat, a member of the academy in the section of physics.—G. Mittag-Leffler: A new theorem in the theory of the series of Dirichlet.—J. Tavani: The integral $\Gamma(\rho)$ and its relations with other definite integrals.—Marcel Baudouin: The discovery and excavation of a menhir found upright and completely buried in a marine alluvium on the coasts of Vendée.—V. Lubimenko: New researches on the pigments of the Chromoleucites.—D. Olaru: The favourable action of manganese on the bacteria of the leguminosæ.—Louis Roule: A new genus of apodal fishes, and some peculiarities of the biology of these creatures.—G. Daumézou: The potato as an agent of dissemination of Friedländer's pneumobacillus in nature, and especially in water.

BOOKS RECEIVED.

Indian Museum. Annual Report, April, 1913, to March, 1914. (Calcutta: Indian Museum.)
 Bulletin de l'Institut Aérodynamique de Koutchino. Fasc. v. Pp. 296. (Moscou: I. N. Kouchnéreff et Cie.)
 Soil Conditions and Plant Growth. By Dr. E. J. Russell. New edition. Pp. viii+190. (London: Longmans and Co.) 5s. net.
 The Carnegie Trust for the Universities of Scotland. Thirteenth Annual Report (for the year 1913-14). Pp. 87. (Edinburgh: T. and A. Constable.)
 Practical Science and Mathematics for the Second Year Preliminary Technical or Industrial Course. By E. J. Edwards and M. J. Tickle. Pp. viii+175. (London: G. Routledge and Sons, Ltd.) 1s. 6d. net.

DIARY OF SOCIETIES.

THURSDAY, MARCH 4.

ROYAL SOCIETY, at 4.30.—A Bolometric Method of Determining the Efficiency of Radiating Bodies: Prof. W. A. Bone, Prof. H. L. Callendar, and H. J. Yates.—The Simplification of the Arithmetical Processes of Involution and Evolution: E. Chappell.—The Elastic Properties of Steel at Moderately High Temperatures: F. E. Rowett.—The Laws of Series Spectra: Prof. J. W. Nicholson.
 ROYAL INSTITUTION, at 3.—Poetry and War: Sir Herbert Warren.
 ROYAL GEOGRAPHICAL SOCIETY, at 5.—Suess's Classification of the Eurasian Mountains: Prof. J. W. Gregory.
 LINNEAN SOCIETY, at 5.—The Lichens of South Lancashire: J. A. Wheldon and W. G. Travis.—The Germination of Marah (*Echinocystis Marah*, Cogn.): A. W. Hill.—New Types of Stem-anatomy in Cycadeoidea, and a well-petrified new Species: Dr. Marie Stopes.—Description of a new Genus and Species of Terrestrial Isopoda from British Guiana: W. E. Collinge.

FRIDAY, MARCH 5.

ROYAL INSTITUTION, at 9.—Mimicry and Butterflies: Prof. E. B. Poulton.
 GEOLOGISTS' ASSOCIATION, at 8.—Geology of the Glasgow District: Prof. J. W. Gregory.

SATURDAY, MARCH 6.

ROYAL INSTITUTION, at 3.—Recent Researches on Atoms and Ions: Sir J. J. Thomson.

MONDAY, MARCH 8.

ROYAL GEOGRAPHICAL SOCIETY, at 8.30.—Our Fisheries and their Geography: Prof. Stanley Gardiner.

TUESDAY, MARCH 9.

ROYAL INSTITUTION, at 3.—Photography in Natural Colours: Prof. W. J. Pope.
 ZOOLOGICAL SOCIETY, at 5.30.
 INSTITUTION OF CIVIL ENGINEERS, at 8.—The Improvement of the River Clyde and Harbour of Glasgow, 1873-1914: Sir Thomas Mason.
 WIRELESS SOCIETY, at 8.—Waves: Dr. J. Erskine-Murray.

WEDNESDAY, MARCH 10.

ROYAL SOCIETY OF ARTS, at 8.—Patent Law Reform and the War: J. W. Gordon.
 GEOLOGICAL SOCIETY, at 8.—The Plants of the Late Glacial Deposits of the Lea Valley: Clement Reid.—The Genus *Lonsdalea* and *Dibunophyllum rugosum* (McCoy); S. Smith.

THURSDAY, MARCH 11.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Contributions to the Study of the Bionomics and Reproductive Processes of the Foraminifera: E. Heron-Allen.—The Occurrence of an Intracranial Ganglion upon the Oculomotor Nerve in *Scyllium Canicula*, with a suggestion as to its Bearing upon the question of the Segmental Value of certain of the Cranial

Nerves: G. E. Nicholls.—Experiments on the Restoration of Paralysed Muscles by Means of Nerve Anastomosis. Part III. Anastomosis of the Brachial Plexus with a consideration of the Distribution of its Roots: Prof. R. Kennedy.—On the Mechanism of the Cardiac Valves. A Preliminary Communication: A. F. S. Kent.
 INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Electric Cooking, mainly from the Consumer's Point of View: W. R. Cooper.
 CHILD STUDY SOCIETY, at 6.—*Discussion*: The Care and Development of the Child—during School Age.—Treatment Centres and their Possibilities: Miss Margaret McMillan.—Care Committees: Mrs. Evelyn.

FRIDAY, MARCH 12.

ROYAL INSTITUTION, at 9.—Back to Lister: Sir R. J. Godlee.
 PHYSICAL SOCIETY, at 8.—(1) The Estimation of High Temperatures by the Method of Colour Identity: (2) The Unit of Candle-power in White Light: C. C. Paterson and B. P. Dudding.—The Relative Losses in Dielectrics in Equivalent Electric Fields, Steady and Alternating (R.M.S.): G. L. Addenbrooke.
 MALACOLOGICAL SOCIETY, at 8.—*Helicella crayfordensis*, n.sp. from the Pleistocene deposits of S.E. England: A. S. Kennard and B. B. Woodward.—Further Notes on Radulæ: the Rev. E. W. Bowell.—The Editions of Swainson's "Exotic Conchology": A. Reynell.
 ROYAL ASTRONOMICAL SOCIETY, at 5.

SATURDAY, MARCH 13.

ROYAL INSTITUTION, at 3.—Recent Researches on Atoms and Ions: Sir J. J. Thomson.

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