

From a hitherto unpublished article which lies before me, and in which I am inclined to place great confidence, I gather as a matter of fact that the time law of enzyme actions differs from the simplest scheme of reaction velocities. This question is, however, not yet ripe for discussion.

The question of the range of substances which can be altered by a given enzyme in a certain manner (for example, hydrolysed) is likewise in the first stage of solution, and there seems to be here similar multiplicity of function to what is found in the case of other catalysts.

The beautiful investigations of E. Fischer have shown that at any rate the very slight differences which nowadays we know in chemistry as stereochemical can bring about alteration in the action of a given enzyme. As to whether this rests on the asymmetric character of the enzyme itself or on other grounds appears to me not to have been decisively ascertained.

I must hasten to a conclusion. I have set myself the task of pointing out the broad provinces of a fertile land, which only here and there shows the first beginning of systematic cultivation, but of which the fruitfulness and importance is beyond all question. Even if the land lies outside the region to which the chemistry of the past was acclimatised, still our restless science has already begun with its new implements to make the new soil fruitful. That it is not only a chemical interest that makes the work grateful I think I have shown you by examples of its physiological application. It is also evident, from the examples which we already have of the application of this auxiliary, that the scientific knowledge and investigation of catalysis must have vast consequences in technical applications. The last great triumph of German technical chemistry, the synthesis of indigo, which will revolutionise the agricultural conditions of whole countries, contains as an essential factor a new catalysis. The oxidation of naphthalene by means of sulphuric acid with speed can only be brought about in the presence of mercury. The sulphuric acid itself, it is hardly necessary to say, is prepared by a catalytic process, whether we use the old or the newer method. When we consider that the acceleration of the reaction by catalysis is achieved without consumption of energy, and so proceeds in this sense *gratis*, and that in chemical industry, as in all other, time is money, we perceive that the systematic utilisation of catalytic appliances is likely to lead to the most thorough-going changes in manufacturing processes.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE Government Education Bill has been the subject of much discussion since Mr. Balfour described its provisions to the House of Commons last week. Public opinion is decidedly in favour of the creation of local educational authorities, but it is felt that unless these new bodies are made responsible for elementary as well as secondary education, the main object of the Bill will be lost. As the president of the National Union of Teachers pointed out at the conference at Bristol, there would still exist in the same district "separate authorities for primary and secondary education, with their useless and unnecessary administrative expenditure, their jealous rivalries and interminable friction." The only way to end this state of things is to make each constituted local authority responsible for the whole of the educational work in its district. There must be no clause making it optional to adopt the elementary part of the measure, for in many cases this would mean that there would still be competing schools and educational agencies instead of an organised system. The members of School Boards who have a real knowledge of education would naturally be absorbed by the local authorities, and those who are more identified with sectarian and political interests would be left to find another platform for their polemics. The views of teachers in primary schools are expressed in the following resolution brought before the Bristol conference by Mr. R. Waddington:—"That conference expresses approval of the main principles of the Education Bill, 1902, under which may be created local authorities controlling and maintaining all forms of education within wide areas, and hereby records its satisfaction with the Government's desire to place our educational system on a sound basis; but is of opinion that the measure cannot become educationally effective unless the permissive clauses of the Bill relating to elementary education be struck out, and it be made compulsory upon the local authorities to take over the control of elementary as well as of higher education." If the Government decide to

withdraw the optional clause the measure will meet with general approval from most educationists.

PROF. R. MELDOLA, F.R.S., has been appointed by the President of the Board of Education a member of the Teachers' Registration Council, which has just been created to consider claims to be admitted to the Register of Teachers.

THE Lord Mayor of Liverpool has issued an appeal for funds to establish a Liverpool University upon the University College of the city. To effect this, about 330,000*l.* will be required, of which there has already been promised no less than 145,000*l.* by leading citizens. The present value of possessions of the College itself amount to more than 500,000*l.*; and the additional sum of 330,000*l.* which is asked for is to complete its equipment as a university. The existing resources of the College, the endowment of chairs and lectureships, amount to 186,300*l.*; the sites acquired and buildings erected and in course of erection, 251,550*l.*: fellowships, scholarships and prizes, 32,800*l.*, exclusive of value of fellowships and scholarships established by annual gifts or granted by city and county councils, the Royal Institution, the Ladies' Educational Association, the Tate trustees, and other bodies outside University College; endowments for maintenance, 20,275*l.*; and day training college hostel and endowment, 10,000*l.* The total of 500,925*l.* does not include the value of books in the library and apparatus in laboratories, nor does it take account of sums, amounting to many thousands of pounds, given to the college year by year for immediate expenditure, nor of the annual income of the affiliated schools of architecture and applied art, public health and tropical medicine. The additional lectureships to be endowed include electrotechnics, geology and chemistry, besides others in connection with commerce, engineering and medicine.

SCIENTIFIC SERIAL.

American Journal of Science, March.—The ventral integument of trilobites, by C. E. Beecher. In previous studies of trilobites the author had not thought it worth while to illustrate the character of the ventral integument, but a recent discovery by Jaekel necessitates the separate consideration of this structure. From a study of a specimen of *Ptychoparia striata*, Jaekel has deduced an entire reconstruction of the appendages and anatomy of the trilobite. An examination of well-preserved specimens of *Triarthrus*, several photographic reproductions of which accompany the paper, leads to the conclusion that the deductions of Jaekel are erroneous.—Igneous rocks from eastern Siberia, by Henry S. Washington. The specimens examined included a foyaitite from East Cape, comendite, quartz-porphyr, rhyolite, obsidian and monzonite from Iskan Bay.—A cosmic cycle, by Frank W. Very.—Studies of Eocene mammalia in the Marsh collection, Peabody Museum, by J. L. Wortman. The present instalment is devoted to a consideration of *Limnocyon verus*, *velox*, *medius* and *dysodus*.—An experimental method in the flow of solids and its application to the compression of a cube of plastic material, by J. R. Benton. Frames of parallel wires were cast into the centre of a cube of Wood's metal. After the cube had been distorted beyond the elastic limits in a testing machine, the fusible metal was melted off and the structure of the framework examined. The condition of the wires after varying treatment is shown in a series of diagrams.—On the occurrence of monazite in iron ore and in graphite, by O. A. Derby.—The molecular weights of some carbon compounds in concentrated solutions with carbon compounds as solvents, by C. L. Speyers.—Clarence King, by S. F. Emmons. An account of the life-work of the late Clarence King.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 6.—"Experimental Researches on Drawn Steel.—Part i. Magnetism and its Changes with Temperature.—Part ii. Resistivity, Elasticity and Density, and the Temperature Coefficients of Resistivity and Elasticity." By J. Reginald Ashworth. Communicated by Prof. Schuster, F.R.S.

When magnets are heated and cooled and the cyclic state is reached, the relation of intensity to temperature is expressed by the equation

$$I_t = I_0 (1 + \alpha t),$$

and the coefficient, α , almost universally is negative. But if a magnet be constructed of pianoforte steel wire, of large enough dimension ratio, then the coefficient is positive and the magnet gains in magnetism as the temperature rises. An attempt to trace the cause of this abnormal behaviour of pianoforte steel has led to a complete experimental investigation of the temperature coefficient of a magnet. Experiments on this wire when in the commercial drawn state, in the annealed condition, and when glass hard showed that it was only in the first state that an incremental coefficient exhibited itself, and it thus appeared that the drawing was responsible for the abnormal behaviour of the pianoforte wire. Samples of such wire were then obtained representing every stage in the manufacture from the rolled rod through annealing and tempering to the utmost stage of drawing, and from experiments on them it was demonstrated that the positive coefficient was developed by moderate drawing, but that extreme drawing tended to reduce it to zero.

The intensity of residual magnetism is remarkably increased by drawing, so that at last it is 200 per cent. greater than at first.

The relation of the curves of magnetisation of a very long thin wire of drawn steel, when cold and when hot, was next traced, and is highly interesting, as the susceptibility hot is always greater than the susceptibility cold even at maximum intensity, and it is not until the demagnetising force has been applied that the curves intersect; with iron and ordinary steel, the intersection of the curves is always on the ascending path. The temperature coefficient of induced and residual magnetism was examined at a number of points on the upward and downward curve for both drawn steel and iron, and it appears that the incremental coefficient in the drawn steel is largest, and the decremental coefficient in iron is least, when the susceptibility is a maximum, and in general the coefficient varies with the susceptibility. Another interesting observation is that after partial demagnetisation, heating and cooling restore some of the lost magnetism, and even when the whole of the magnetism is removed and an inverse magnetism of small intensity is impressed by the reversed force, heating and cooling clear this out and restore some of the original magnetism. The bearing of these experiments on the construction of magnets of constant intensity is pointed out. Observations extending over several years are given on four magnets of drawn steel.

In part ii. the relation of drawing to resistivity, to Young's modulus, and to density is traced. Resistivity is diminished by moderate drawing, but extreme traction again increases it; the temperature coefficient of resistivity is affected inversely to the resistivity. Young's modulus increases with moderate drawing and sharply declines with extreme traction; its temperature coefficient behaves inversely, so that when the modulus is large the coefficient is small, and conversely.

Density increases throughout with traction to the last stage and is then 8 grams per cubic centimetre. Magnetic intensity and density seem to be closely related, varying proportionally over a considerable range, so that the ratio of magnetic moment to the mass approaches a constant.

Chemical Society, March 19.—Prof. Emerson Reynolds, V.P.R.S., in the chair.—Nitrogen chlorides containing the propionyl group, by Dr. Chattaway. A description of chloro-derivatives of propionanilide obtained by the interaction of hypochlorous acid with propionyl derivatives of aniline.—The constitution of the metallic cyanides as deduced from their synthetic interactions. The constitution of hydrogen cyanide, by Mr. J. Wade. The formation of both organic nitriles and isonitriles by the interaction of alkyl halides with metallic cyanides seems to imply that the latter may in some cases have either of the constitutions R.CN and R.N:C. The author adopts an extended form of Nel's explanation for this reaction, which assumes that the metallic cyanides are really isocyanides, and that the formation of nitriles on interaction with alkyl halides only occurs where the metal is highly positive and its isocyanide capable of forming an intermediate addition compound with the alkyl halide.—The absorption spectra of metallic nitrates, i., by Prof. Hartley, F.R.S. The author has investigated the absorption spectra of various nitrates in dilute aqueous solution. A full discussion of the results will be given in a later paper.—A method of determining the ratio of distribution of a base between two acids, by Messrs Dawson and Grant. An aqueous solution of the base and the acids is shaken with an immiscible solvent capable of extracting one of the four possible substances present in the mixture. From the amount so removed

the concentration of that substance in the solution can be determined and indirectly the amount in combination.—The molecular complexity of acetic acid in chloroform solution, by Mr. H. M. Dawson. A study of the way in which acetic acid distributes itself between chloroform and water with increasing dilution leads the author to believe that a gradual dissociation of the double molecules occurs with dilution.—The existence of polyiodides in nitrobenzene solution, by Messrs. Dawson and Gawler. In studying the ratio of distribution of iodine between the two solvents nitrobenzene and aqueous solution of potassium iodine, it was found that nitrobenzene containing iodine dissolves considerable amounts of potassium iodide due to the formation of polyiodides of potassium.—Derivatives of α -aminocamphoroxime, by Dr. Lapworth and Mr. Harvey. A description of salts and other derivatives of this oxime.—Preparation of sulphamide from ammonium amidosulphite, by Prof. Divers, F.R.S., and Mr. Ogawa. When ammonium amidosulphite is slowly heated to about 70° C., it yields about 10 per cent. of sulphamide.—Hypoiodous acid, by Mr. R. L. Taylor. The author finds that the amount of hypoiodous acid formed by the interaction of iodine and mercuric oxide depends to some extent on the fineness of division of the iodine, precipitated iodine furnishing 44 to 52 per cent. of the possible yield, whilst powdered iodine gives only small amounts.—Synthesis of imino-ethers, by Dr. G. D. Lander. A description of N-aryl benzimino-ethers produced by the interaction of aromatic imide chlorides and sodium alcoholates.—Nitration of *sym*.trihalogenacetanilides, by Dr. Orton. A description of substances obtained by the action of nitric acid on *sym*.tribromacetanilide and chloridibromacetanilide.—Purpurogallin, by Messrs. A. G. Perkin and A. B. Steven. A description of various derivatives and decomposition products of this substance, obtained in oxidising pyrogallol.—Quercetazetin, by Mr. A. G. Perkin. The flowers of the African marigold *Tagetes patula* contain a crystalline yellow colouring-matter of the formula $C_{27}H_{22}O_{13}$, to which the above name was given by Latour and Magnier de la Source in 1877. Its composition is now found to be better represented by the simpler formula $C_{15}H_{10}O_8$; it furnishes like pyrone derivatives a sulphate and a potassium compound, and when fused with potash yields protocatechuic acid and an unidentified phenol.

MANCHESTER.

Literary and Philosophical Society, March 18.—Mr. Charles Bailey, president, in the chair.—Mr. J. E. King read the second and concluding part of his paper on the folk-lore of the North American Indians, from the Jesuit relations (1611 to 1637). This described funeral rites. The bodies of the dead, he said, were first buried in village cemeteries, but after eight or ten years a great "Feast of the Dead" was held, and the bones were reburied in a grave common to many villages. After the second burial, the soul went away to the village of the dead in the west. As with other savages, the burial ceremonies implied two feelings, namely, fear of the ghost and desire to maintain a bond of union with the kindred dead. Burial and cremation were said to imply different ideas as to the future of the soul after death, but this was not illustrated by Indian beliefs, for the Indians buried their dead and also believed in their continued existence in another world. They also held the doctrine of metempsychosis, as was shown in the practice of resuscitating dead chiefs by passing on their names to living representatives. The Canadian Indians had a special form of burial for children who died in infancy; so had the ancient Romans, and so had the Hindus, West Africans, and other tribes and nations. The Hindus and Maoris, however, regarded the spirit of an infant with dread. The Canadians and other nations looked upon such spirits as helpless and pitiable, and the mode of burial adopted indicated a belief in rebirth. The paper concluded with a quotation from Lescarbots, written in 1612, which anticipated the doctrine of survival in culture.—Mr. R. F. Gwyther read a paper on the conditions which determine the rate of propagation of an earth tremor.

PARIS.

Academy of Sciences, March 24.—M. Bouquet de la Grye in the chair.—On a non-suppurative form of osteomyelitis, by M. Lannelongue. Although acute osteomyelitis is ordinarily accompanied by the staphylococcus discovered by Pasteur in certain rare forms of the disease, the symptoms of which are

given in detail, this staphylococcus is always accompanied by other micro-organisms, in one case a streptococcus, in another a *Bacterium coli*, and in another a short bacillus as yet undetermined.—Remarks relating to the demonstration of the therapeutic properties of the methylarsenate of soda, by M. Armand Gautier. Remarks on a communication on this subject by M. Mouneyrat.—The extension of Lagrange's theorem to viscous liquids and the conditions at the limits, by M. P. Duhem. The theorem of Lagrange, extended to viscous liquids, is incompatible with the conditions that liquids ought to verify along solid walls.—The direct hydrogenation of the oxides of carbon in presence of various finely divided metals, by MM. Paul Sabatier and J. B. Senderens. If in the reaction between nickel, carbon monoxide and hydrogen the temperature is raised much above 250° C., a certain proportion of carbon dioxide is always found among the products, which at 380° C. may amount to as much as 10 per cent. of the whole. The effect of replacing nickel by other metals was then examined. With cobalt the reaction proceeds exactly as with nickel, without any secondary reactions. Neither platinum, palladium, iron, nor copper gives rise to any methane under similar conditions.—On a theorem of Frobenius, by M. de Séguier.—On commutative homogeneous linear differential expressions, by M. George Wallenburg.—Oscillations peculiar to a network of conductors in electrical distribution, by M. J. B. Pomey.—On forces which act on a cathode flux placed in a magnetic field, by M. H. Pellat.—Hertzian waves in storms, by M. Firmin Larroque. In examining the effect of very distant storms, it was found that the suppression of the horizontal plate in the apparatus rendered the system inert, but that the suppression of the vertical portion of the apparatus had no effect upon the sensibility of the apparatus. The electrical oscillations are therefore horizontal. If the storm was not so distant, less than 300 kilometres, the inverse effect was generally observed.—Contribution to the study of sounding pipes, by M. C. Maltezós.—The specific heat of bodies at the absolute zero, by M. Ponsot. The author deduces by thermodynamical reasoning that at the absolute zero two systems of solid bodies comprising the same elements have the same specific heat, and discusses several particular cases.—On the boiling-point of selenium and on some other pyrometric constants, by M. Daniel Berthelot. The measurements were carried out by the interference method previously described, the necessary uniformity in heating being achieved by the use of an electrically heated nickel spiral. The boiling-point of selenium was found to be 690° C., or 25° higher than that hitherto admitted.—On the thermal equivalent of dissociation and of vaporisation, and on the heat of solidification of ammonia, by M. de Forcrand.—On a monosodium acid orthophosphate, by M. H. Giran. It has been supposed from the experiments of Zettnow that the crystals which cover the sticks of commercial metaphosphoric acid were a variety of orthophosphoric acid. It is now shown that these crystals consist of a sodium salt of the composition $\text{NaH}_2(\text{PO}_4)_2$.—On sesquisodium phosphate, by M. J. B. Senderens. The sodium phosphate described as new by M. Joulie in a recent paper in the *Comptes rendus* was discovered in 1882 by MM. Filhol and Senderens.—The action of the halogen ethers on the sulpho-carbonic compounds of secondary amines, by M. Marcel Delépine.—On some new compounds of methylene, by M. Marcel Descudé. In presence of zinc chloride, trioxymethylene condenses readily with acid chlorides, the products being obtained of the types $\text{R.COO.CH}_2\text{Cl}$ and $(\text{R.CO.O})_2\text{CH}_2$. A list of new compounds prepared by this reaction is appended.—Cane sugar in the food reserves of phanerogams, by M. Em. Bourquelot.—On the digestion of the mannane of the tubercles of orchids, by M. H. Hérissé. The mannane of the tubercles of orchids can, like the albumens, be transformed into mannose by the action of soluble ferments present in the plant.—The action of sulphurous acid as an antidote against *la casse* in wines, by M. J. Laborde. It has been shown that the destructive action of the oxydase on the red colouring matter in wine, the disease known as *la casse*, can be prevented by the addition of sulphurous acid. It is here shown that the contact of sulphurous acid and the oxydase alone is not sufficient to destroy the oxydase, and that it is the oxygen of the air which appears to be the principal agent of destruction in this case.—On the geological section of the *massif* of the Simplon, by M. Maurice Lugeon.—On the fragments of pumice found on the ocean floor, by M. J. Thoulet.—On radiometry and its application to pelvimetry, by M. Th. Guilloz.

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DIARY OF SOCIETIES.

THURSDAY, APRIL 3.

RÖNTGEN SOCIETY, at 8.30.—X-Ray Diagnosis of Renal Calculus: Dr. Ch. Leonard.

LINNÆAN SOCIETY, at 8.—On the Composite Flora of Africa: W. Spencer Moore.—A Halonial Branch of *Lepidophlois fuliginosus*: Prof. F. E. Weiss.

FRIDAY, APRIL 4.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Compressed-Air and its Applications: L. G. Crawford.

GEOLOGISTS' ASSOCIATION, at 8.—Klondike, its Geology and Mining: Prof. H. A. Miers, F.R.S.

MONDAY, APRIL 7.

SOCIETY OF CHEMICAL INDUSTRY, at 8.—Some Recent Improvements in the Photography of Colour: E. Sanger Shepherd.

VICTORIA INSTITUTE, at 4.30.—Locusts and Grasshoppers: Rev. F. A. Walker.

TUESDAY, APRIL 8.

ROYAL INSTITUTION, at 3.—Recent Methods and Results in Biological Inquiry: Dr. Allan Macfadyen.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Papers to be further discussed: The Greenwich Footway-Tunnel: W. C. Copperthwaite.—Subaqueous Tunnelling through the Thames Gravel, Baker Street and Waterloo Railway: A. H. Haigh.

SOCIETY OF ARTS, at 8.—Street Architecture: Prof. Beresford Pite.

WEDNESDAY, APRIL 9.

SOCIETY OF ARTS, at 8.—Ceuta and Gibraltar: Major-General John F. Crease.

THURSDAY, APRIL 10.

MATHEMATICAL SOCIETY, at 5.30.—A Note on Divergent Series: Dr. Hobson, F.R.S.—Stress and Strain in Two-dimensional Elastic Systems: Prof. Love, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Problems of Electric Railways: J. Swinburne and W. R. Cooper.

ROYAL INSTITUTION, at 3.—The Oxygen Group of Elements: Prof. Dewar, F.R.S.

FRIDAY, APRIL 11.

PHYSICAL SOCIETY, at 5.—An Apparatus for Vapour-pressure Measurements: Mr. Grant.—(1) The use of Cathode Rays for Alternating-Current Measurements; (2) An Experiment on the Current Growth in an Inductive Circuit: Mr. Morris.—An Electric Heater: Dr. R. A. Lehfeldt.—Note on the Compound Pendulum: S. A. F. White.

ROYAL ASTRONOMICAL SOCIETY, at 5.

MALACOLOGICAL SOCIETY, at 8.

ROYAL INSTITUTION, at 9.—Problems of the Atmosphere: Prof. Dewar, F.R.S.

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