converts the same quantity of oxygen into the 'active' state, as it itself takes up in the formation of the *primary* product of oxidation."

THE theory of electrolytic dissociation, which is of such great importance in modern chemical speculations, has been hitherto almost exclusively confined, in its application, to aqueous solutions. Notwithstanding the few investigations of the electrical conductivity of solutions of salts in other solvents which have already appeared, our knowledge of the ionisation of such solutions is still very fragmentary. An extensive series of measurements of the conductivity of solutions of salts in methyl alcohol, published by Messrs. Zelinsky and Krapiwin in the current number of the *Zeitschrift für physikalische Chemie*, is therefore very welcome. They find that the methyl alcohol solutions have, in many cases, conductivities of the same order of magnitude as the aqueous solutions. For example, the conductivities of methyl alcoholic and aqueous solutions of potassium bromide of the same strength are in the ratio 1 : 1·5 approximately, with tetramethyl-ammonium bromide the ratio is 1·1, and the dilute alcoholic solutions of trimethylsulphine iodide possess almost the same conductivities as the aqueous solutions. The influence of the change of solvent is more marked with the acids; oxalic and trichloracetic acids, for example, the aqueous solutions of which are good conductors, possess very small conductivities in methyl alcoholic solution. In all cases the molecular conductivity increases with increasing dilution; he limit does not appear, however, to have been reached for any of the substances examined. The molecu ar conductivity of some of the badly conducting substances increases with the dilution in much the same way as is the case with aqueous solutions of feebly dissociated substances, viz. approximately in proportion to the square root of the dilution. For example, the molecule conductivity of a solution of tin diethyl iodide, $Sn(C_2H_5)_2I_2$, increases 1·36 times when the dilution is doubled, instead of $\sqrt{2} = 1{\cdot}41$ times; with trichloracetic acid the increase s 1·365 times. A curious fact, no explanation of which is as yet forthcoming, is that the substitution of a sma quantity of alcohol for water diminishes the conductivity of the aqueous solutions considerably, and that the addition of a little water to the alcohol used has the same effect on the alcoholic solutions. Measurements of the conductivities of some salts dissolved in a mixture of equal parts by weight of methyl alcohol and water, show that they are almost exactly half those found in pure water, or 25–30 per cent. smaller than those found in pure methyl alcohol.

THE additions to the Zoological Society's Gardens during the past week include three Purple-faced Monkeys (*Semnopithecu, leucoprymnus*) from Ceylon, a Rhesus Monkey (*Macacus rhesus*), a —— Bamboo Rat (*Rhizomys*, sp. inc.), a —— Mouse (*Mus*, sp. inc), three —— Doves (*Turtur*, sp. inc.), eleven Burmese Tortoises (*Testudo elongata*), seven Black-backed Tortoises (*Testudo platynota*), three Ceylonese Terrapins (*Nicoria trijuga*, var. *edeniana*), four Shielded River Turtles (*Emys scutata*), five Cocteau's Geckos (*Hemidactylus coctæi*), twelve Verticillated Geckos (*Gecko verticillatus*), six Yellowish Monitors (*Varanus flavescens*), six Doria's Lizards (*Mabuia doriæ*), six Emma's Lizards (*Calotes emma*), three Bell's Lizards (*Liolepis belliana*), five Robed Snakes (*Tropidonotus stolatus*), two Fishing Snakes (*Tropidonotus piscator*), a Rayed Snake (*Coluber radiatus*), a Condenar Sand-Snake (*Psammophis condanarus*), two Well-spotted Snakes (*Dipsadomorphus multimaculatus*), two Olivaceus Water-Snakes (*Hypsirhina euhydris*), an Aulic Snake (*Lycodon aulicus*), two Ornamental Tree Snakes (*Chrysopelea ornata*), four Grass-Green Tree Snakes (*Dryophis prasina*). two Long-snouted Snakes (*Passerita mycterizans*), a Hamadryad (*Ophiophagus elaps*), a Banded Bungarus (*Bungarus fasciatus*), an Indian Cobra (*Naia tripudians*), three Russell's Vipers (*Vipera russelli*), eleven Green Pit-Vipers (*Lachesis gramineus*) from Burmah, presented by Mr. W. C. Bligh; a Black Lemur (*Lemur macao*) from Madagascar, presented by Captain H. Talboys; a Black Wallaby (*Halmaturus nalabatus*) from New South Wales, presented by Mr. Malcolm Watson; a Moorish Tortoise (*Testudo mauritanica*) from North Africa, presented by Mr. R. M. C. Souper; a Yellow-cheeked Lemur (*Lemur xanthomystax*) from Madagascar, presented by Mr. H. O. Townshend; a Smith's Dwarf Lemur (*Microcebus smithi*) from Madagascar, presented by Dr. Hubert E. J. Bliss; two Panolia Deer (*Cervus eldi*) from Burmah, deposited; two Virginian Eagle Owls (*Bubo virginianus*) from North America, purchased; a Great Eagle Owl (*Bubo maximus*) European, received in exchange.

OUR ASTRONOMICAL COLUMN.

COMET 1870 II.—This comet was discovered on August 28, by Coggia in Marseilles, and was last observed by Pechüle in Hamburg. During the period of its visibility it described a heliocentric arc of about 59°. On September 26 it approached its least distance from the earth, this being measured as 0·885 radii of the earth's orbit. In appearance the comet resembled a nebular mass with a perceptible nucleus; it varied, however, considerably, sometimes appearing without a nucleus, while at other times several nuclei were observed. Up to the present time the ephemeris obtained from the elements, computed by Gerst, represented very well the observed positions.

These elements were as follows :—

T = 1870 September 2·23393 Berlin Mean Time.

$\pi = 7\ 53\ 19{\cdot}0$
$\Omega = 12\ 56\ 22{\cdot}4$ } 1870·0
$i = 99\ 20\ 45{\cdot}9$
$\log q = 0{\cdot}259288$

Dr. Anton Schobloch has, however, undertaken the investigation of determining more thoroughly the elements of this comet. In this calculation he has included 311 observations, made at various observatories. The main figures in the computation will be found in *Astronomische Nachrichten* (No. 3383), together with the list of the observations and comparison stars used. The result shows, however, that there is no reason to depart from the assumption of a parabolic orbit. The final elements, as given below, differ only slightly from those obtained by Gerst. They are, as the following figures show :

Mean Equinox, 1870·0. Osculation, September 13·5, Berlin Mean Time.

T = 1870 September 2·2318232 Berlin Mean Time.

$\pi = 7\ 53\ 15{\cdot}14$
$\Omega = 12\ 56\ 18{\cdot}78$ } Ecliptic
$i = 99\ 21\ 3{\cdot}90$
$\log q = 0{\cdot}2592768.$

COMET GIACOBINI.—This comet is not a very bright object in the heavens, but as Prof. Kreutz appeals for more observations to enable an accurate determination of its period possible, we give the following ephemeris. The elements on which this is based are those obtained by Messrs. Perrotin and Giacobini from observations made on September 4, 12, and 27. A glance at the ephemeris, given in *Astr. Nach.* (No. 3384), shows that the southern declination of the comet commences, about November 3, to decrease.

Ephemeris for 12h. Berlin Mean Time.

1896.		R.A. app. h. m. s.	Decl. app. ° ′	log r.	log Δ	Br.
Oct. 29	...	19 36 26	−13 43·5	0·1616	0·1177	0·97
30	...	39 42	44·6			
31	...	42 58	45·4			
Nov. 1	...	46 15	46·0			
2	...	49 32	46·3	0·1620	0·1243	0·94
3	...	52 50	46·4			
4	...	56 8	46·2			
5	...	19 59 27	−13 45·7			

PLANETARY NOTES.—In the current number of *Astronomische Nachrichten* (No. 3384), the following information. which was telegraphed by Mr. Percival Lowell to Mr. J. Ritchie, jun., in Boston, is given :—

Oct. 4 Phison and Euphrates, Martian canals are double.

Oct. 5 Mercury and Venus rotate once on their axes in a revolution round the sun. Venus is not cloud covered but veiled in an atmosphere. Mercury is not.

Thus Mr. Lowell favours the view held by Schiaparelli and Perrotin regarding the length of the period of rotation of Venus. It may be remembered that this latter observer made a series of observations only last year to corroborate his previous work. He took up his position on a mountain (Monnier) 2741 metres high, where the atmosphere seemed all that could be desired for his observations. The result of his study was the same as that which he had formerly obtained. The appearance of the planet's terminator at different times suffered no variation, and the western limb, which could be well seen, resembled exactly the eastern as it was observed in 1890. Further, by watching carefully the dark markings at the different periods of time, the phenomenon of libration was noticed, a fact which considerably strengthens the hypothesis of a longer time of rotation than that favoured by several other observers, namely, about twenty-four hours.

At present the weight of evidence seems to favour the hypothesis of the long period, but it cannot be said as yet that the question is finally settled, for opinion is still divided.

PHYSIOLOGY AT THE BRITISH ASSOCIATION.

THE formation of an independent section for Physiology and Experimental Pathology has been fully justified by the success of its second meeting at Liverpool. In scientific importance the communications compared favourably with those of Oxford, whilst the number of papers was so large that the business of the Section was with difficulty got through, although the sittings were extended to six days.

The proceedings opened on Thursday with a communication by Prof. McKendrick, on the application of the phonograph to the analysis of sounds. A new method of transcribing the phonographic records was demonstrated; the essential feature of this method consisted in an aluminium lever connected at one end with a special form of syphon recorder, and having the other shaped so as to accurately fit the grooves cut on the phonographic cylinder. A further feature of the transcribing apparatus was obtained by causing the phonographic cylinder to rotate with extreme slowness; by this means the vibrations of the syphon recorder could be transcribed on a continuous slip of paper, such as is employed in telegraphy, travelling at such speed that the phonogram events of 1″ were spread out over a distance of 10 feet on the record. An ingenious arrangement caused the continuous slip of paper to vibrate so as to obviate the necessity of the syphon recorder coming in contact with the paper, and thus diminishing to a minimum any error due to the friction of the writing pen. The transcribed tracings, magnified by the lever, represented the actual cylinder phonograms magnified 500 to 1000 times in amplitude. The tracings showed (1) that many musical instruments give a transcribed form which is absolutely characteristic; (2) that such characteristic form may be detected in very complicated phonograms—for instance, that caused by a band of instruments, including that which, when alone, gives the special form; (3) that when numerous sounds of different pitch follow one another in rapid succession, the ear recognises relative pitch when the transcribed curve shows that the special vibration for this has been repeated only ten times, *i.e.* when the sound has lasted a mere fraction of a second, presumably $\frac{1}{50}''$.

By means of a resonator comprising a microphone contact, the phonographic cylinder was made to produce oscillations which enabled the record to be transformed into variations of current intensity; the apparatus being much the same as that used by Hurthlé for obtaining electrical changes in correspondence with the sounds of the heart. The cylinder was arranged so that when driven slowly it communicated the record of its grooved inscription to a suitable tambour, and thus to the microphonic circuit. The variations in current intensity are, with suitable battery power, easily appreciated when conducted through the moistened hands, and give rise to specific series of sensations which can be appreciated by the deaf; it is thus possible that the rhythm, magnitude, and possibly the specific character of a phonogram may be rendered capable of being understood, apart from the sense of hearing.

Mr. R. J. Lloyd read a critical paper on the production of vowel sounds, and discussed the value of the phonographic evidence at present available for the analysis of such sounds.

Prof. Macallum, of Toronto, gave a short communication on a means of detecting the difference between organic and inorganic salts of iron. An absolutely pure solution of hæmatoxylin is turned bluish-black in the presence of inorganic salts of iron, but is not so affected by organic compounds. If the organic compounds of iron present in any tissue—spleen, liver, &c.—are changed by suitable treatment with acid, so as to produce inorganic iron salts, then the tissue stains very darkly with the hæmatoxylin, and is quite different in appearance to that which is produced by the same dye when no such inorganic salt is present. The views advanced by Bunge as to the introduction of iron into the system by means of organic, in preference to inorganic iron compounds, have resulted in the production of a very large number of so-called organic iron remedial agents. Prof. Macallum showed that a considerable number of these contained large quantities of the inorganic iron salts, which would be detected by the above method. The importance of possessing an easy and effectual means for differentiating between the two sets of iron compounds is by no means confined to the analysis of such remedial agents; a large number of physiological processes are intimately bound up with the transfer or the presence of iron, and the method of determining such an essential character of its chemical relations may be employed in many physiological investigations.

Dr. Marcet read a paper on types of human respiration. After a short introduction describing the graphic method employed in the investigation, the following different types were contrasted: (1) normal automatic breathing; (2) forced breathing; (3) breathing during exercise; (4) breathing whilst under the influence of a strong volitional effort. Forced breathing is characterised by a large increase in the volume of air taken in at each inspiration, its cessation being followed by the well-known pause, *i.e.* apnœa. Breathing during exercise gives tracings which are to be interpreted as indicating a similar increased amplitude in each inspiration; but on cessation of exercise there is no pause, the increased inspiratory effect being maintained, and only slowly returning to the normal. Breathing is influenced by any pronounced volitional effort, even when this effort is not carried out by obvious muscular activity. Thus a strong volitional effort towards a form of movement will cause an increase in the volume of inspired air. This increase may be seen superadded to that caused by actual exercise when both the exercise and the volitional effort are contemporaneous.

On Friday, Profs. Lorrain Smith and Westbrook gave an account of the febrile reaction produced in mice by inoculation with cultures of *Bacillus pyocyaneus*, *B. anthacis*, *murisepticus*, &c. Although these animals react to the inoculation, the febrile condition presents several remarkable characteristics as regards metabolism; thus the variations in respiratory interchange were not so marked as those due to food, or to alterations in the temperature of the surroundings in the normal animal. Similarly the elimination of nitrogen was not increased to the extent to which it was by food, although in mice the normal nitrogenous balance is one in which the diurnal intake and output is for the body weight extremely large. The febrile reaction in these animals appears not to be associated with a large increase in general metabolism; and this fact demonstrates the necessity for careful study of the conditions under which it occurs in separate groups of animals.

Prof. Thompson (Belfast) followed with a paper on the physiological effects of peptone when injected into the venous system. The injection of Witte's peptone dissolved in physiological sodium chloride solution produces well-known effects, the most prominent being the alteration in the coagulability of the blood and a vascular dilatation, causing a fall of blood pressure. The present investigation brought out some further points as to the production of these phenomena, which may be summarised as follows. (1) In doses over two centigrammes per kilo of body weight the peptone retards the susceptibility of blood to coagulation, but in weaker doses it actually favours such susceptibility; (2) even very small doses of ten milligrammes per kilo, if rapidly injected, can cause a fall of blood pressure; (3) the fall of blood pressure is due to the peripheral effect of the