

THE question of the nature of red phosphorus is one that has been frequently discussed, the general trend of the evidence being to show that red phosphorus is a polymer of white phosphorus. Some new and interesting experiments on this subject are contributed by Dr. R. Schenck to the current number of the *Berichte*. Starting with the well-known equation of van 't Hoff $-dC/dt = k.C^n$, in which C is the concentration, t the time, and n the number of molecules taking part in a reaction, he determines the velocity of transformation of white into red phosphorus in solution in phosphorus tribromide at 172°C . and 184°C ., and finds that $n = 2$ is the only value of n which gives a constant value for k in the velocity equation. From this the conclusion is drawn that the equation $(\text{P}_4)_2 = \text{P}_8$ represents the first stage of the conversion of white into red phosphorus. It is, however, quite possible that this only represents the first stage in the process, the differences in the properties of the two varieties being so great that it is unlikely that they could be caused by such a small change in molecular weight.

AN important discovery in medical science is announced by M. Armand Gautier in the current number of the *Comptes rendus*. He has found that sodium methylarsenate, injected into the blood in minute amounts, is an absolute cure for malarial fever. Particulars are given of the treatment of nine cases, all of which had been contracted in Africa, and which were of such a severe type as to be refractory to large doses of quinine. The nine cases were rapidly cured, two only showing a slight relapse, and these yielded at once to a second injection. The progress of the cure was followed in each case by the examination of the blood, and the treatment was always followed by the disappearance of the specific hematozoa. The salt was also found to suppress entirely the anæmia associated with malaria. M. Gautier regards the results as sufficiently definite to authorise the substitution of this drug for quinine in pernicious malaria, although it still remains for further researches to determine the best dose, and whether administration by the mouth or hypodermically is to be preferred.

A COMPLETE index of the first thirty volumes of the *Journal de Physique* (1872-1901), arranged both according to authors and according to subject-matter of papers, has been announced.

THE behaviour of liquid sulphur dioxide as a solvent has been very completely investigated by Messrs. Walden and Centnerszwer, an account of whose researches is contained in vol. xxxix. of the *Zeitschrift für physikalische Chemie* (pp. 513-596). It is found that liquid sulphur dioxide easily dissolves a large number of (binary) inorganic salts and most salts of organic bases. The solutions of these salts are good conductors of electricity. The simple laws which regulate the conductivity of aqueous solutions of salts are in general not valid for the sulphur dioxide solutions. Amongst these may be mentioned Kohlrausch's law of the independent wandering of the ions, Ostwald's dilution law, the law according to which the molecular conductivity approaches to a maximum with increasing dilution, and the rule according to which the increase in the conductivity with the dilution is the same for all binary salts. The conductivity of solutions has been investigated at temperatures ranging from the freezing point of liquid sulphur dioxide to its critical point. The molecular conductivity increases at first with the temperature, reaches a maximum at a temperature dependent upon the nature of the dissolved salt, and then decreases with a further rise of temperature, becoming finally zero at the critical temperature, although the salts remain dissolved even at temperatures above the critical temperature. The authors conclude from this observation that electrolytic dissociation in solutions is an essential property of, or conditioned by, the liquid state of aggregation. Determinations

of the molecular weight of dissolved salts by the boiling-point method give values higher than the normal, from which it would appear that the molecules of the dissolved salts are to a considerable extent polymerised, or form complex associated molecules containing molecules of the solvent.

THE additions to the Zoological Society's Gardens during the past week include a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Dr. Worley; a Pochard (*Fuligula ferina*), European, presented by Dr. H. S. Jameson; a Smooth-headed Capuchin (*Cebus monachus*) from South America, a White-fronted Capuchin (*Cebus albifrons*), a Hoary Fox (*Canis vetulus*) from Brazil, a Blue-fronted Amazon (*Chrysotis aestiva*), five Giant Toads (*Bufo marinus*) from South America, an American Green Frog (*Rana halecina*) from Central America, two Gangetic Trionyx (*Trionyx galaticus*) from India, deposited.

OUR ASTRONOMICAL COLUMN.

THE NEW BRUCE SPECTROGRAPH FOR THE YERKES REFRACTOR.—This instrument has been provided from funds supplied in 1899 by Miss Catherine Bruce and the Rumford fund of the American Academy of Arts and Sciences. The arrangement of the various parts has been designed in view of obtaining the greatest possible rigidity and uniformity of temperature, as the principal work for which it is to be employed is the determination of velocities in the line of sight. To this end several departures have been made from ordinary designs. The foundation consists of two castings rigidly connected by a framework of steel tubes, one of these castings, weighing about 200 pounds, being attached to the massive terminal ring of the 40-inch refractor by eight bolts. The collimator tube is firmly attached to this and the second casting, which latter also holds the framework on which the prism train is mounted. It was decided to use three prisms of such angle that the total deviation was 180° , thereby rendering the instrument more compact and free from flexure. The optical train, consisting of the correcting lens, collimating lens, prisms and camera lens, were made by Brashear from formulæ supplied by Prof. Hastings. The correcting lens is 57 mm. aperture, and is so designed that when placed 100 cm. in front of the focus of the 40-inch for $\lambda 4500$, the angular aperture of the large lens is not altered. The performance of this lens has been found to be very satisfactory, rendering it possible to obtain a star spectrum of uniform width from $\lambda 4300$ – $\lambda 4700$.

The collimator has a triple cemented lens of 51 mm. aperture and 958 mm. focus.

The first set of prisms, made from Mantois glass, was not satisfactory, and has been replaced by prisms made from glass supplied by Messrs. Schott and Co., of Jena. These are not perfect, but have given sufficiently good results to warrant their adoption. The refracting angles are about $63\frac{1}{2}^\circ$.

Two camera lenses are provided, one being a Zeiss anastigmat, aperture 71 mm., focal length 449 mm., the other a triple cemented lens designed by Prof. Hastings, with aperture of 76 mm. and focus 607 mm.

For the region of H_γ the dispersion of this spectrograph is almost identical with that given by the Mills and Potsdam III. spectrographs.

For temperature control the whole instrument is enclosed in a double-walled case of aluminium; thick felt is packed in the space between the two metal sheets, and a helix of thin wire distributed through this provides a convenient means of keeping the temperature of the prism chamber almost constant for a considerable time. For comparison spectra, electrodes of titanium and iron are used, and also a vacuum tube of helium.

In following, the method devised by Huggins of using the slit plate as a reflector has been adopted, several variations being made to avoid the inconvenience of having the two slit-jaws in different planes with respect to the collimator axis.

An extensive series of preliminary photographs has been taken and reduced, and the instrument is now in use for standard determinations of spectroscopic binaries, &c., which can only be detected by the variable radial velocity deduced from the displacement of spectrum lines (*Astrophysical Journal*, vol. xv. pp. 1-27).