Ross in regard to his discoveries in connection with deadly tropical diseases. Science was everything to industry, and man found that money profits could be made by taking advantage of the advances of science. He was an optimist about industry, but he could not be an optimist when he looked round and saw members of his profession who had laboured for nothing, scarcely even the thanks of the public, certainly without those rewards for which those engaged in industry rightly and properly looked. He referred also to the fact that the headmasters of the public schools generally were clergymen, and deprecated the lack of provision made in those schools for scientific instruction.

Sir William Byrne (Home Office), in proposing the toast of "The British Science Guild," said that he agreed with the statement in the annual report of the guild, that Government Departments used the services of scientific men without remuneration. The charge was irrefutable. Virtue might be its own reward, but science rarely was. He sympathised with them, and promised that so far as he was concerned he would do his best to alter this state of things.

FLUIDS WITH VISIBLE MOLECULES.

PROF. JEAN PERRIN (of the University of Paris) in his recent course of lectures at King's College, London, dealt with aggregates of suspended particles regarded as fluids consisting of visible microscopic molecules. The Brownian movement of such particles appears to be due to molecular agitation, suggesting that particles in suspension function as enormous molecules. If this is so, the laws of gases extended by Van't Hoff to solutions apply also to dilute emulsions consisting of uniform grains, and from a knowledge of the osmotic pressure of this "gas of visible molecules," one can calculate, using Avogadro's law, the ratio of the masses of the grains to those of the molecule of any gas, an indefinite vertical column of emulsion in equilibrium having the properties of a miniature atmosphere.

Suitable emulsions are prepared by isolating uniform particles of precipitated resin by fractional centrifugalisation. Such emulsions obey the laws of gases and give the correct value for Avogadro's number N, whatever the size of the particles.

Since dilute emulsions obey the laws of gases concentrated emulsions should behave analogously to compressed fluids, and the equation $(P+a/V^2)(V-b)=RT$, be applicable, where V represents the volume of the emulsion, b is four times the volume of the grains present, and a a constant which in Van der Waals's equation corresponds to cohesion. Experiment, while verifying the prediction, shows the interesting peculiarity that in the case of emulsions the cohesion constant is negative, the grains repelling one another appreciably. This result allows the experimental determination of the thickness of the double layer of electrification by contact, and throws light on the properties of colloidal solutions.

The Brownian activity of a grain is defined as E^2/t, where E^2 is the mean square of the displacement in the time t. An emulsion should diffuse as a solution of visible molecules with a speed proportional to the speed of the molecules which compose it. It can be shown that the speed of diffusion D is $1/6\, E^2/t$, and since in the steady state as many molecules pass upward through any level by diffusion as pass downward through the level by gravitation, Einstein's equation holds, viz. :—

$$\frac{F^2}{t} = 6D = \frac{RT}{N}\frac{1}{\pi r z}$$

where r is the radius of the grains and z the viscosity of the intergranular fluid. Thus both by measuring the rate of diffusion and by measuring the displacement Avogadro's constant has been determined.

Emulsions were prepared of such a nature that those grains touching one side of the retaining vessel became attached and the emulsion progressively weaker by diffusion, the variation with time in the number of grains captured giving a measure of the rate of diffusion.

By selecting relatively large spherules it was found possible to measure their rate of rotation, and thus verify Einstein's formula for the Brownian movement of rotation.

These theories also apply to grains suspended in a gas except that Stokes's law is no longer applicable, but by applying an electric field to the charged particles Townsend's equation for the diffusion of ions relates the charge on the granule with Avogadro's number and the activity of its Brownian movement.

$$Ne = \frac{RT}{D}\frac{u}{H} = 6RT\frac{t}{E^2}\frac{u}{H}.$$

The values of N, the number of molecules in a cubic centimetre of a gas under standard conditions, deduced by these various methods, exhibit a remarkable concordance. Prof. Perrin concluded his lectures with a critical comparison of the results of his measurements of N with the values which have been deduced from determinations of the charge of an electron, from counting alpha particles, and from the theory of radiation.

CONTRIBUTIONS TO VERTEBRATE PALÆONTOLOGY.

THE skull of a remarkable new generic type of horned dinosaur (*Styracosaurus albertensis*), from the Cretaceous of the Red Deer River, Alberta, is described and figured by Mr. L. M. Lambe in the *Ottawa Naturalist* for December, 1913 (vol. xxvii., pp. 109–16, plates x.–xii.). It was found by the well-known collector Mr. C. H. Sternberg, last summer. The skull is long, depressed, and wedge-shaped, with a single nasal horn of somewhat unusual shape; but its chief peculiarities are the large size of the supra-temporal fossæ, and the production of the hind border of the great occipital flange into four pairs of spines, of which the three innermost on each side are very long. Although the Alberta horned dinosaur may be generically identical with an imperfectly known species from the Cretaceous of Montana, referred by Cope to the genus Monoclonius, under the name of *M. sphenocerus*, it is considered that the two are specifically distinct.

According to an article by Mr. C. Schuchert on the dinosaurs of German East Africa, published in the *American Journal of Science* for 1913 (vol. xxxv., pp. 33–8), the largest representative of the genus first described as Gigantosaurus, but now known, on account of the preoccupation of the original name, as Tornieria, is believed to have been about twice the length of Diplodocus, or at least 150 ft. The neck appears to have exceeded that of the American species by a length of about 15 ft. It is hoped to set up a skeleton of this gigantic reptile in the Berlin Museum.

At the conclusion of a note on the relationship between the Permian reptiles of South Africa and those of Russia, published in the *Journal of Geology* for November and December, 1913 (vol. xxi., pp. 728–30), Dr. R. Broom expresses the opinion that the dicynodonts of the Durna valley represent the Ciste-

© 1914 Nature Publishing Group

cephalus zone in Africa, which contains dicynodonts of very similar type. If this be so, the Cistecephalus zone will be topmost Permian, and the underlying Pariasaurus zone Middle Permian.

In an article in the February number of the *American Naturalist* Prof. E. C. Case shows that the "sail-backed" reptile, *Edaphosaurus crucifer*, of which a restoration is given, is perfectly distinct from the genus Dimetrodon, with which it had been incorrectly identified. So far from the two being identical, Dimetrodon was carnivorous, whereas Edaphosaurus probably subsisted on molluscs or insects, with perhaps an occasional vegetable meal. Unlike most of its reptilian contemporaries, its head was small in proportion to the body; the dentition consisted of a marginal series of sharp conical teeth, and of crushing teeth on the palate, the latter opposed by a corresponding series on the inner side of the lower jaw.

We have received a corrected copy of a reprint from Dr L. Reinhardt's "Vom Nebelfleck zum Menschen" (second edition), issued as an appendix to Dr. H. Hallier's "Der Stambaum des Pflanzenreiches" (Munich), which is being completed by Dr. Reinhardt himself. This appendix, in addition to a table exhibiting the geological succession of the leading groups of plants and animals, as exemplified in central Europe, contains a number of phylogenetic "trees" illustrating the evolution of animals and of plants, as well as of many of their classes and orders. Many criticisms of these "trees" might be made, but it must suffice to mention that the author regards the toothed whales as descended from early carnivorous, and the whalebone whales from primitive herbivorous mammals. Mammals themselves he derives from Permian "Urreptilien," which in turn gave rise to "Sauromammalien," a group from which the carnivorous theriodonts are expressly excluded.

In an article published in the *Bull. Amer. Mus. Nat. Hist.* for 1913 (vol. xxxii., pp. 261–274) Prof. H. F. Osborn shows that a skull from the Eocene of Wyoming described by Cope in 1884, and referred to the genus Triplopus, under the name *T. amarorum*, really belongs to the Chalicotheriidæ, or perissodactyles with edentate claws, of which it is the earliest known representative. It is consequently made the type of a new genus, Eomoropus, which is believed to be a specialised offshoot from the stock which gave rise to the titanotheres, on one hand, and to the forerunners of the horse group on the other.

Three publications dealing with the horse family and its extinct forerunners have been issued recently in America. The first, entitled the "Evolution of the Horse," takes the form of a fully illustrated guide to the members of the group exhibited in the American Museum of Natural History. In the first part, Dr. W. D. Matthew discusses the evolution of the horse group in nature, while in the second Mr. S. H. Chubb deals with the origin of the domesticated breeds of the horse, and the structure, growth, and succession of the teeth, this latter section forming a really valuable contribution to science. In a memoir published by the Irving Press, New York, under the title of "The Horse, Past and Present," Prof. H. F. Osborn treats of the same collection, and also of the members of the horse family now living in the New York Zoological Park. In the third publication, which is in the form of a guide-book to the remains of extinct perissodactyles allied to the existing horse group preserved in Yale University, Dr. R. S. Lull records the various expeditions—starting from 1870—which have contributed to the collection, and concludes with a brief summary of the equine pedigree.

THE ROYAL SOCIETY OF TASMANIA.[1]

TO commemorate the seventieth anniversary of the foundation of the Royal Society of Tasmania, the secretary, Mr. E. L. Piesse, has prepared a valuable sketch of its history. The society dates from October 24, 1843, and therefore from a quarrelsome epoch of Tasmanian history. Its founder, Sir John Eardley Wilmot, had landed as Governor before arrival of the news of Sir John Franklin's recall; and an uncomfortable situation was relieved by Wilmot's undertaking a tour in the northern part of the island until Sir John Franklin had time to vacate Government House. Sir John Franklin in 1838 had established a Society for the Promotion of Natural History in Tasmania, and after a nameless existence it adopted in 1842 the title of "The Tasmanian Society." With characteristic generosity Lady Franklin established a Franklin Museum about three miles from Hobart, and endowed it with 410 acres of land, A museum building in a classic style of architecture was erected, but in consequence of uncertainty as to the ownership, owing to vagueness in the deed of gift, Lady Franklin's ideas have not been carried into effect. Shortly after his arrival, Eardley Wilmot determined to reconstitute the Tasmanian Society; but its members were mostly Franklinites, and all but five of them withdrew from the meeting, owing to disputes over unimportant details.

The Governor and those who remained then established a new society under the name of the Botanical and Horticultural Society of Van Diemen's Land. Its main objects, according to the charter, were "to develop the physical character of the island and illustrate its natural history and productions." Next year Queen Victoria became the patron of the society. It accordingly became the Royal Society of Van Diemen's Land, a title which was necessarily changed in 1855, when the name of the colony was altered to Tasmania. The older Tasmanian Society was merged in the Royal Society in 1848, and in the same year the society established the Tasmanian Museum, and in the next year commenced the publication of its Papers and Proceedings. In 1860 the site of the present museum in Hobart was given to the society by the Government, and the new museum was finished in 1862, and extended in 1886 and 1901. The society has done excellent work by the formation of valuable Tasmanian collections and by the publication of its papers and Proceedings, which are one of the main storehouses of information on the natural science of Tasmania.

Mr. Piesse's paper is published in the volume for 1913, which also includes a series of valuable contributions to knowledge of Tasmania. Mr. Rodway, the Government botanist, contributes a monograph on the Tasmanian mosses, including short summaries of all the species known in the island. These belong to 114 genera

Mr. Beattie reprints with explanatory notes a list of words used by the Oyster Bay tribe; the list was compiled in 1824, and has only recently been discovered. Dr. Noetling describes a section near Hobart, and insists that all the fossiliferous beds of southern Australia, which have long been generally assigned to the Eocene, are at the earliest Miocene. This conclusion is further supported by the description of a fossil whale from Wynyard on the northern coast of Tasmania, by H. H. Scott. Mr. Piesse contributes two papers on proportional representation, which is adopted in Tasmania. J. W. G.

[1] Papers and Proceedings of the Royal Society of Tasmania for the Year 1913. 337 pp., 1 text-fig. 22 plates, 1 map. (Hobart, 1914). Price 15s.

© 1914 Nature Publishing Group