allow them to be seen, as dots, under a magnification of more than 3000. The colour correction leaves little to be desired, Carpenter's deal test has been applied, but no more than a very feeble trace of colour has been seen in any of the rings. This lens will be a valuable addition to a battery of objectives, and when its actual magnification is taken into account accurate statements of the actual power used can be made.

PRIZE AWARDS OF THE PARIS ACADEMY OF SCIENCES.

THE president of the Paris Academy of Sciences has announced the prizes awarded for the year 1912 as follows:—

Geometry.—Grand prize of the mathematical sciences divided between Pierre Boutroux (3000 francs), Jean Chazy (2000 francs), and René Garnier (2000 francs); the Francœur prize to Emile Lemoine, for the whole of his mathematical works; the Poncelet prize to Edmond Maillet.

Mechanics.—The Montyon prize to Ad. Doutre, for his inventions in connection with the stability of aëroplanes; the Fourneyron prize between G. Eiffel (1000 francs), for his experiments on the resistance of the air, and Armand de Gramont (700 francs), for his books on aerodynamics; the Boileau prize to A. Lafay, for his experimental studies on various problems concerning the action of the wind on solid bodies.

Navigation.—The extraordinary prize for the Navy between M. Le Page (2000 francs), Captain Ronarch (2000 francs), and M. Marbec (2000 francs); the Plumey prize between Victor Garnier (2000 francs), for his invention of a periscope for use in submarine navigation, and Henri Fabre (2000 francs), for his studies on the hydroaeroplane.

Astronomy.—The Lalande prize between H. Kobold and C. W. Wirtz, for their work on the determination of the motion of nebulæ; the Valz prize to A. Schaumasse, for his observations on comets; the Janssen medal (astronomy) to M. Perot, for the application of interference methods to the study of the solar spectrum; the Pierre Guzman prize was not awarded.

Geography.—The Tchihatchef prize to the Duke of the Abruzzi, for the results obtained in his expedition to the Himalayas; the Binoux prize to M. Fichot, for his geodesic researches; the Delalande-Guérineau prize to Captain Tilho, for his geographical work in Central Africa; the Gay prize was not awarded, but Lieut.-Col. Delaunev receives an honourable mention.

Physics.—The Hébert prize to M. Houllevigue, for his researches in magnetism and thermoelectricity; the Hughes prizes to Arnaud de Gramont, for his spectroscopic work; the La Caze prize to Marcel Brillouin, for the whole of his researches in physics.

Chemistry.—The Jecker prize to M. Bourquelot, for his work on the chemistry of plants and plant ferments; the Montyon prize (unhealthy trades) to Paul Adam, for his work on the reduction of nuisance in the manufacture of superphosphate and his improvements in the storage of petrol and other dangerously inflammable liquids; the Cahours prize between Mme. Ramart-Lucas, Paul Clausmann, and M. Ostwald; the La Caze prize (chemistry) to M. Urbain, for his researches on the rare earths.

Mineralogy and Geology.—The Victor Paulin prize to Henri Arsandaux, for his chemical and petrographical work on silicate rocks.

Botany.—The Desmazieres prize to Elie and Emile Marchal, for their work on mosses; the Montagne prize between Mme. Paul Lemoine (1000 francs) and H. Collin (500 francs); the de Coincy prize to Camille Servettaz, for his monograph on the Eleagnaceæ.

Anatomy and Zoology.—The Da Gama Machado prize to J. Duesberg, for work relating to spermatogenesis of mammals; the Thore prize to Antoine Grouvelle, for his work on the Coleoptera; the Savigny prize to Louis German, for his researches on the malacological fauna of tropical Africa.

Medicine and Surgery.—Montyon prizes (2500 francs each) to V. Pachon, for his memoirs relating to the measurement of arterial pressure in man, Charles Nicolle, for his work on exanthematic typhoid, and O. Josué, for his researches on arterio-sclerosis; mentions (1500 francs each) are accorded to H. Carré, M. Mathis and M. Léger, and Etienne Ginestous; citations are accorded to Jean Troisier, Henri Claude and Stephen Chauvet, Albert Sézary, A. Magitot, Louis Renon, Noël Fiessinger, Georges Schreiber; the Barbier prize to Eugène Léger, for his pharmacological researches; the Breant prize was not awarded, but the arrears of interest were divided between C. J. Finlay (2500 francs) and A. Agramonte (2500 francs), for their work on the relation of mosquitoes to the propagation of yellow fever; the Godard prize to Jacques Parisot, for his work on the functions of the kidney and the suprarenal capsules; the Baron Larrey prize to Dr. Troussaint, for his memoir on the direction of the sanitary service in war, very honourable mentions being accorded to Ch. Teissier, M. Talon, R. Pigache and M. Worms, A. Conor; the Bellion prize to Mme. Banda-Legrain, for her work against alcoholism, J. Cavaillé receiving an honourable mention; the Mège prize is not awarded, the arrears of interest being given to Mme. Long-Landry, for her researches on Little's disease.

Physiology.—A Montyon prize (experimental physiology) to Paul Portier, for his studies on the digestive zymases, very honourable mentions being accorded to Max Kollmann, Théodore Rosset, and Jules Glover; the Philipeaux prize divided between E. F. Terroine and Marcel Lisbonne; the La Caze prize (physiology) to E. Wertheimer, for the whole of his work in physiology; the Martin-Damourette prize to Maurice Arthus, for his researches on the physiology of snake poisons; the Lallemand prize between Gabriel Petit and Léon Marchand, for their memoir on the comparative pathology of the nervous system, and Giuseppe Sterzi, for his work on the nervous system of the vertebrates; the Pourat prize to F. Maignon, for his experiments on the function of albumen as a food.

Statistics.—A Montyon prize (statistics) between Henri Auterbe (800 francs), Louis de Goy (600 francs), M. Janselme and M. Barre (300 francs), and Broquin Lacombe (300 francs).

History of the Sciences.—The Binoux prize to J. L. Heiberg, for his works on the history of mathematics; an additional prize (1000 francs) to Marcel Landrieux, for his book on the life and work of Lamarck.

General Prizes.—The Arago medal to Prince Roland Bonaparte; Berthelot medals to M. Bourquelot, Paul Adam, M. Clausmann, M. Ostwald, and Mme. Ramart-Lucas; the Gegner prize (400 francs) to J. H. Fabre; the Lannelongue prize between Mme. Cusco and Mme. Ruck; the Gustave Roux prize to Armand Billard; the Trémont prize to Charles Frémont; the Wilde prize to M. Ferrie, for his work in the development of wireless telegraphy; the Lonchampt prize between M. Grimbert (2000 francs), M. Bagros (1000 francs), and Jules Wolff (1000 francs); the Saintour prize to Maurice Langeron (with 2000 francs), and a mention (with 1000 francs) to Will Darvillé; the Bordon prize is not awarded, but R. Robinson receives an encouragement (2000 francs); the Houllevigue prize between Henri Lebesgue (3000 francs) and M.

Taveau (2000 francs); the Caméré prize to M. Gisclard; the Jerome Ponti prize to Georges Rouy, for his researches in systematic botany; the Leconte prize between Charles Tellier (8000 francs) and M. Forest (12,000 francs); the prize founded by Mme. la Marquise de Laplace to Jules Adolphe Menj; the prize founded by M. Felix Rivot between J. A. Menj, J F. G. Daval, R. G. R. Mabilleau, and R. E Bollack.

THE TIN MINES OF NEW SOUTH WALES.[1]

THE more rapid growth of the demand for tin than of the supply, and the disappointing failure of aluminium to replace tin for many purposes for which it was hoped to prove an efficient substitute, have led to the more careful study of the tin fields of the world and to an increase in the tin production by about a third in the first decade of this century. Mr. J. E. Carne has added a monograph on the tin mines of New South Wales to the series of valuable monographs with which he has enriched the economic geology of Australia.

The monograph is careful and exhaustive, and shows the author's combined caution and insight. It consists mostly of detailed descriptions of the tin mines and mining fields, and the economic problems naturally receive greater attention than the theoretical. There is, however, an interesting discussion of the genesis of tin ores, and the account of the mines is often enriched with suggestions of general interest. Economic questions are especially important in connection with a metal which is subject to such violent fluctuations in value, for the price of tin on the London market has varied since 1905 between 120*l.* and its present price of 230*l.* per ton. The association of tin with pegmatite veins has led to its being often claimed as one of the metals most likely to be of direct igneous origin; but Mr. Carne rejects the view that the tin in some granites was a primary constituent of the granite, and has been collected into veins as a direct differentiation product. He lays stress on the evidence which points to the deposition of the tin after the complete consolidation of the granite.

The New South Wales tin deposits are, however, not of the kind for which there is most to be said for the igneous theory. Mr. Carne gives a list of seventy-seven tin veins in New South Wales, and in sixty-nine of these the tin is associated with quartz, in twenty-nine with chlorite, in wenty with felspar, and in only three with tourmaline. The rarity of the association with tourmaline suggests that tin in New South Wales is not a pneumatolytic product.

The first record of tin in Australia which Mr. Carne accepts as authentic was in 1824. Actual tin-mining in New South Wales only began in 1872. Since 1875 the largest field—Emmaville—has yielded about 52,000 tons, and the Tingha field has yielded slightly less (45,500 tons). The tin mines in New South Wales include both alluvial deposits and lodes. The lodes belong to a type in which the distribution of the tin is sporadic and the patches of ore become smaller and poorer in depth. The deepest tin mine in Australia is the Vulcan Mine in North Queensland, which has already attained the depth of 1400 ft. The deepest in New South Wales is only 360 ft., and Mr. Carne's account of the lodes renders this fact not surprising.

J. W. G.

[1] "The Tin mining Industry and the Distribution of Tin Ores in New South Wales." By J. E. Carne. (New South Wales Department of Mines, Geological Survey, Mineral Resources No. 14.) Pp. 378+xxxiii plates+8 figs.+14 maps and sections+iii maps in portfolio. (Sydney, 1911.)

OSMOTIC PRESSURE AND THE THEORY OF SOLUTIONS.

ATTENTION may be directed to a paper by Prof. A. Findlay on osmotic pressure and the theory of solutions, which has recently been published in *Scientia*. It has sometimes been suggested that the problems of osmotic pressure were solved once for all by van't Hoff's discovery that the gas equation PV=RT could be applied to solutions by substituting "osmotic pressure" for "gas pressure." But the recent exact measurements of the Earl of Berkeley and Mr. Hartley in England and of Morse and his colleagues in America have shown clearly that this simple equation is so restricted that it cannot in practice be applied with any approach to accuracy in the case of any of those solutions of which the osmotic pressures have been exactly measured.

As Prof. Findlay points out, the first limitation to the equation PV=RT, when applied to solutions, is that the method used in deducing it only holds good for very dilute solutions. For stronger solutions the equation $P=\frac{RT}{V}=\frac{RT}{V_0}x$ becomes

$$P=\frac{RT}{V_0}\left\{-\log_e(1-x)\right\}=\frac{RT}{V}\left\{x+\tfrac{1}{2}x^2+\tfrac{1}{3}x^3, \text{\&c.}\right\}$$

where V_0 is the molecular volume of the solute and x is the molar ratio, *i.e.* the ratio of the number of molecules of solute to the total number of molecules present.

This equation assumes that there is no formation of complex molecules, no change of energy or volume on mixing the liquid solvent and solute, and that the solution is incompressible. G. N. Lewis has shown that it holds good in a marvellous way when applied to vapour pressure measurements in mixtures of propylene bromide and ethylene bromide at 85°. But even this equation fails to represent with any approach to accuracy the measured osmotic pressures of cane-sugar solutions. Better results are obtained by assuming the formation of a hydrate of the sugar, but it is abundantly clear that van't Hoff's equation is only the beginning and not the end of the quantitative study of osmotic pressure, and that direct measurements of this property are still of the highest importance in studying the theory of solutions.

ENGINEERING AT THE BRITISH ASSOCIATION.

A GLANCE at the proceedings of the Mechanical Science Section shows that a wide range of subjects was considered by the members, and, indeed, much planning was required to group the papers in such a way that all could be read and adequately discussed, and every moment of the available time was fully occupied in carrying out the longest programme of recent years.

In the course of his presidential address on the Thursday morning, Prof. Barr discussed the relation of the engineer to the public, both from a utilitarian and an æsthetic point of view, and by aid of many illustrations of modern engineering achievements he again and again enforced his main argument that the maintenance of a high ideal in all engineering work was necessary to obtain the highest good for the greatest number.

Such illustrations as the attainment of dustless roads, smokeless factories, ships, and locomotives, and the abandonment of all sham decoration of engineering structures gave point to an address which was free