

yearly refraction in *Astronomische Nachrichten*, No. 4699, due to the observations of Venus being compared with an ephemeris computed from Leverrier's tables, which, as he says, are in error in a respect important in a discussion of this kind. The result of the correction is greatly to increase the refraction in the neighbourhood of the sun found by Courvoisier.

RESEARCHES AT THE ALLEGHENY OBSERVATORY.—No. 4, vol. iii., of the Publications of the Allegheny Observatory contains an account of the orbit of λ Tauri by Prof. Frank Schlesinger. The variable nature of this star was originally discovered by Baxandell in 1848, and it was the second star, Algol being the first, that was recognised as an eclipsing variable. In this research eighty-nine spectrograms of the star were utilised, and from these the definite elements are given in the paper with the velocity curve corresponding to them. Certain residuals indicate the presence of some disturbing element in the system the nature of which is unknown. Mr. Frank C. Jordan, in No. 5 of the Publications, deals with the spectrographic observations of ϕ Persei, a variable which has received considerable attention by a great number of observers. The special character of the spectrum and velocity curve, coupled with the changes which take place in the spectrum of this star at different parts of its orbit, and in its velocity curve in different cycles, presents a problem yet unsolved. Mr. Jordan's investigation adds another research to the star's credit, but he finds that no single orbit or combination of orbits will satisfy the conditions required. In No. 6 of the Publications Mr. A. H. Pfund describes a very satisfactory result to his preliminary thermo-electric measures of stellar radiation. While the conditions under which he had to employ his apparatus were by no means very favourable to secure the best results, yet the magnitudes of the deflections he obtained were very promising. In his paper he describes the general arrangement of the apparatus and the thermal junctions used, and gives the deflections due to Vega, Jupiter, and Altair. Mr. Jordan suggests the desirability of developing thermo junctions of still higher sensitiveness, and galvanometers of greater sensitiveness, and uses them in conjunction with the largest reflectors, so that stars down to even the 4th magnitude may be studied.

ZODIACAL MATTER AND THE SOLAR CONSTANT.—In citing four cases where zones of asteroids have been hypothecated to explain planetary and cometary perturbations and lunar inequalities, Mr. E. Belot, in a note in *Comptes rendus* (No. 18) points out that he published in 1905 a formula to take the place of Bode's law, and that certain of the five zones of asteroids this formula predicts supply just the material in just the right positions. He proceeds further, and makes the suggestion that the transit of these zones across the sun's disc may be found to supply the probable cause of variation of the solar constant established by the work of Abbot, Fowle, and Aldrich.

THE PHYSICAL SOCIETY'S EXHIBITION.

THE ninth annual exhibition of the Physical Society of London was held in the Physical Department of the Imperial College of Science on Tuesday, December 16, and attracted the usual large attendance at both afternoon and evening sessions. In addition to the short discourses which have for some years formed a popular feature of the exhibition, a new departure was made by the introduction of several interesting experiments illustrative of recent research. In the exhibition proper about thirty firms showed their most recent forms of apparatus.

The first discourse was given by Mr. Louis Brennan, C.B., who exhibited and described a simple

apparatus for making large soap films, and demonstrated their properties. The film was formed on a frame of elastic which was capable of considerable extension, thus reducing the thickness of the film and showing the consequent change of the colour of the reflected light. The second discourse was by Prof. J. A. Fleming on the vibrations of loaded and unloaded strings. The string was caused to vibrate by means of a motor, to the shaft of which one end was excentrically attached. The tension could be adjusted by moving the pillar to which the other end was fixed. The effect of loading was shown by using strings twisted together, and also by the addition of beads. The reflection which takes place when the wave-length is reduced to the distance between successive beads was clearly shown, as was also the difference between the effect of a single large load and that produced by a load distributed over some distance, gradually increasing in amount and then diminishing. Prof. Fleming pointed out the application of these experiments to the case of the reflection and transmission of light at the boundary of two media, and to the more important case of loaded telephone cables.

Among the experiments already mentioned, Mr. W. E. Curtis exhibited the band spectrum of helium. A vacuum tube at a pressure of several millimetres was excited by an induction coil, a condenser and spark-gap being included in the secondary circuit. With suitable capacity and length of gap, the spectrum shows a number of bands in addition to the ordinary helium lines. An experiment illustrating ionisation by collision was shown by Mr. F. J. Harlow. An electrodeless discharge was excited in a spherical bulb and the pressure reduced. It was found that the discharge could be continued at a much less pressure than usual if heated lime or aluminium phosphate was present to produce ionisation. The phosphorescence of mercury-vapour in a vacuum excited by light from a mercury lamp was exhibited by Mr. F. S. Phillips. Prof. J. T. Morris and Mr. J. F. Forrest showed an electric arc which they suggest for use as a standard of light, the light from the positive crater being quite unobstructed. Messrs. C. C. Paterson and B. P. Dudding had a simple device on exhibition for reducing the glare from motor headlights by confining the light to the region below the horizontal on the right-hand side as seen from the car. An indicator for use with high-speed internal-combustion engines was shown by Dr. W. Watson, and also an arrangement for studying the spectrum of a burning mixture at different stages of the combustion. An experiment on the interference of X-rays by a crystal of rock-salt through which they were passed was shown by Dr. G. W. C. Kaye and Mr. E. A. Owen, the crystal patterns being visible on a fluorescent screen.

THERE was a large number of interesting features among the exhibits of the firms. The Cambridge Scientific Instrument Co. had on view an electrostatic oscillograph designed by Prof. H. Ho and S. Kotô, of Japan, which possesses important advantages over the electromagnetic oscillograph for high-voltage work. A contact-breaker for physiological work which could successively interrupt two circuits with an intervening period of from 0.0002 second to 0.04 second was also shown. An inexpensive form of independent plug contact for resistance boxes was shown by Messrs. Gambrell Bros. A simple apparatus for measuring the pressure of light, designed by Mr. G. D. West, was exhibited by Messrs. J. J. Griffin and Sons. Mr. R. W. Paul exhibited a large number of electrical laboratory instruments, including a simple device for projecting an image of the scale and pointer of an instrument on a screen for lecture

purposes. Among the exhibits of Messrs. Isenthal and Co. was a collection of pladuram products, a form of tungsten specially treated, which it is hoped to apply to purposes where a hard, inert metal is required. Radio-active preparations were shown by Mr. F. Harrison Glew. The principal exhibit of Messrs. Muirhead and Co. was a Heurtley magnifier for use in cable telegraphy or wireless telegraphy, or wherever it is required to magnify the effect of small mechanical movements. Instruments connected with wireless telegraphy were shown by the Marconi Company, the Ludgate Wireless Company, and Messrs. Graham and Latham, while very complete exhibits of projection apparatus and microscopes for all purposes were shown by Messrs. Carl Zeiss, Messrs. E. Leitz, Messrs. Newton and Co., and other firms. The instruments of Messrs. H. Tinsley and Co. for colour measurement and for lens testing, and the new miniature precision instruments of the Weston Co., are also worthy of mention.

THIRD INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE.

THE first International Congress of Tropical Agriculture was held in Paris in 1905, and was organised by a number of French men of science interested in this subject. At its close the Association Scientifique Internationale d'Agronomie Coloniale et Tropicale was founded, to promote in every possible way scientific work in tropical agriculture. Branches of this association were gradually founded in Belgium, France, Germany, Great Britain, Italy, Portugal, and elsewhere, until at present practically every country interested, either on its own account or through its colonies, in tropical agriculture, is represented on the Central Bureau of the association, which has its headquarters in Paris. In 1910 a very successful second Congress of Tropical Agriculture was held in Brussels. At the close of that congress M. de Lanessan, formerly Governor-General of Indo-China, who had up till that time been president of the association, retired, and was succeeded by Prof. Wyndham Dunstan, C.M.G., F.R.S., director of the Imperial Institute.

The International Association has decided to hold the third Congress of Tropical Agriculture in London, at the Imperial Institute, on June 23-30 next year, under the presidency of Prof. Dunstan. A strong organising committee, including Sir D. Prain, director of the Royal Gardens, Kew; Sir S. Stockman, chief veterinary officer to the Board of Agriculture and Fisheries; Mr. Bernard Coventry, Agricultural Adviser to the Government of India; Dr. F. Watts, Imperial Commissioner of Agriculture for the West Indies, and other eminent authorities on tropical agriculture, has been at work for some time in preparation for the congress.

It is proposed to devote the afternoon meetings of the congress to papers, and the morning meetings to a series of discussions on important problems of special interest, such as technical education and research in tropical agriculture; outstanding scientific problems in rubber production; methods of developing cotton cultivation in new countries; problems of fibre production; agriculture in arid regions; and hygiene and preventive medicine, in their relation to tropical agriculture. The organising committee will welcome contributions on these or allied subjects.

For further information regarding the arrangements for the congress, the communication of papers, &c., application should be made to the organising secretaries (Dr. T. A. Henry and Mr. H. Brown), Third International Congress of Tropical Agriculture, Imperial Institute, London, S.W.

NO. 2303, VOL. 92]

PHYSICAL CHEMISTRY OF SOLUTIONS.

AS is well known, the progress in the physical chemistry of solutions which has been made during the last thirty years, though extensive and detailed in a certain sense, has nevertheless suffered not a little from the fact that fully 90 per cent. of the investigations have been restricted to the study of the behaviour of substances dissolved in *water*. At the present time, therefore, whilst a very large amount of data has been accumulated upon the subject of aqueous solutions, our knowledge of the behaviour of non-aqueous solutions and solutions formed in mixed solvents is deplorably scanty. Of course, here and there the subject has been attacked, especially within the last decade, and a few general conclusions have been laboriously attained. Many of the rules, however, which serve as a trustworthy guide in the case of aqueous solutions have to be considerably modified or even discarded altogether when we come to non-aqueous solutions. At the same time, it is clear that the problem of solution in general cannot be regarded as in a satisfactory state, so long as generalisations applicable to a large number of solvents at least are wanting.

It is for this reason that we welcome the monograph published by Prof. H. C. Jones, entitled "The freezing point-lowering, conductivity, and viscosity of solutions of certain electrolytes in water, methyl alcohol, ethyl alcohol, acetone, and glycerol, and in mixtures of these solvents with one another" (Publication No. 180, Carnegie Institution of Washington). The present work is to be regarded as supplementary to Publication No. 80 of the same institution. The actual experimental work has been carried out by several investigators, under the direction of Prof. Jones. Each of these investigators, after giving an account of the experimental methods and results obtained for various salts—inorganic salts—in various solvents, pure and mixed, makes a very brief summary of conclusions, the whole field being finally reviewed by Prof. Jones himself in a general discussion, which occupies the last dozen pages or so of the book. As was to be expected, great stress is laid upon the generality of the phenomenon of solvation and much of the work is devoted to the elucidation—naturally with varying success—of the three fundamental factors:—(1) Change in solvation, which changes the mass and size of the ion; (2) change in the viscosity of the solution with change in temperature thereby affecting the friction of the ions in moving through the solution; and (3) change in the number of dissolved particles—molecules and ions.

The publication as a whole is a monument of industry which reflects the greatest credit upon the laboratory from which it emanates. It is sincerely to be hoped that the systematic accumulation of similar data will become much more general than has hitherto been the case.

PHYSIOLOGY AT THE BRITISH ASSOCIATION.

THIS has been a year of congresses for physiologists. The International Congress of Medicine, the International Congress of Physiology, and the British Association all took place during August and September. In spite of the fact that the British Association came last, the section of physiology had a very successful meeting.

The president's address was especially interesting, as it gave the views of an organic chemist on the physico-chemical aspect of his work. The address has already appeared in NATURE (October 16, p. 213).