

of synthetic methyl rubber are produced monthly. At first the substitute proved unsatisfactory, being oxidised by the air, and it was hard to vulcanise. Improvements in manufacture have, however, overcome this trouble. By experimenting with the addition of other substitutes, a vulcanite is now produced which equals the natural material in firmness and durability, and is 20 per cent. better for electrical purposes. At ordinary temperatures, however, the soft rubber is not elastic, but leather-like; it becomes elastic as its temperature is raised. The addition of dimethylaniline and toluidine increases elasticity. The substitute is now used, with satisfactory results, for heavy road motors.

THE Reichsanstalt at Charlottenburg has carried out an extensive series of tests on the effect of chemical changes and heat treatment on the magnetic properties of iron alloys. Tests were also made to ascertain the change of the temperature coefficient of bar-magnets with variations in their dimensions. Reducing the length of a 0.6 cm. thick bar from 22 to 2.4 cm. produced an increase of 2.4 to 4.2 per cent. in the mean temperature coefficient between 20° and 100° C. Tests were made with bars 0.9 cm. thick and of length varying between 33 cm. and 6 cm.; and it was found that the determination of the coercive force was trustworthy within 1 to 2 per cent. (using the magnetometer method) for cylindrical bars with values of l/d (l =length, d =diameter) down to 10, but that the value obtained for the coercive force was rather too small for lower values of l/d . These results are given in the *Zeitschrift für Instrumentenkunde* for May last, but the main results of the investigation will not be published until after the war.

SULPHUROUS acid liberated in the combustion of pyrites and other sulphurous substances contained in coal is rapidly transformed into sulphuric acid in the atmosphere. It is found in rain-water and snow. If the rain-water or snow is left for a few hours, the small quantities of non-oxidised sulphurous acid that they contain are rapidly converted into sulphuric acid. Thus the determination of the quantity of sulphuric acid in the snow or rain provides a means of determining the vitiation of the air in a particular industrial district by factory smoke. In one and the same industrial region from 6 to 9 mg. of sulphuric acid (or sulphuric anhydride) per cubic metre of snow was found in places protected from the wind, and three times that quantity in places not so protected. The mean was 15 to 20 mg. The quantity diminishes rapidly with increase in distance from the source of vitiation. According to the *Zeitschrift für angewandte Chemie* for April 9, similar data were found on experimenting with rain-water. It is also possible to determine the deleterious action on plant-life through the same cause by collecting, by suitable means, the rain collecting at a tree-trunk, and comparing the foliage, etc., with that of other trees in another neighbourhood (not near a factory) offering the same climatic conditions.

THE June *Biochemical Journal* contains work on the antineuritic and antiscorbutic accessory substances by Messrs. A. Harden and S. S. Zilva. These authors find that pigeons are protected from attacks of polyneuritis by autolysed yeast, but not by autolysed yeast which has been shaken with fuller's earth or with dialysed iron, thus confirming Seidell's observation. Further, polyneuritis is curable by autolysed yeast, but not by autolysed yeast which has been treated with the adsorbent, and a bad case was cured by administration of the solution obtained by alcoholic extraction of the dialysed iron precipitate and evaporation *in*

vacuo. On the other hand, when the precipitate obtained by shaking orange-juice with dialysed iron is extracted with alcohol, the product will not cure guinea-pigs of scurvy, nor will it protect healthy animals against attacks of the disease. But orange-juice which has been treated with dialysed iron or with fuller's earth retains practically all its antiscorbutic activity so far as can be judged biologically. A mixture of equal parts of orange-juice and autolysed yeast will both cure and protect from attacks of polyneuritis and scurvy. But after treatment with fuller's earth the mixture was found to have lost its antineuritic power whilst retaining its activity against scurvy. Thus it is shown that the antineuritic and antiscorbutic principles behave differently towards adsorbents. Orange-juice can be filtered through a Berkefeld filter without losing an appreciable amount of its antiscorbutic activity.

IN order to supply material for testing the theories of thermal and electrical conductivities in metals and alloys, and especially in ferro-magnetic substances, Prof. K. Honda, of Sendai University, has measured the thermal and electrical conductivities of a number of nickel-steels. His results are given in the July issue of the Science Reports of the University. He finds that both the electrical and thermal conductivities decrease rapidly as iron is added to nickel or nickel to iron, and that an alloy containing 30 per cent. of nickel has the least conductivity in both cases. The curves showing the variation of the conductivities with content have the same general appearance as the melting-point curves for a binary mixture. The least electrical conductivity is about one-fifth and the least thermal about one-tenth the conductivity of either pure substance. The quotient of the thermal by the electrical conductivity varies from about 2 to about 1.5 millions. The magnetisation curves for the alloys are also given, and show low susceptibilities for alloys containing 27 to 30 per cent. of nickel.

RAPID inter-Imperial communication of every description now promises to become so vital a matter for developing inter-Imperial trade—as well as for other eminently important national reasons—that Mr. Charles Bright has prepared a revised edition of the map included in his recent book, "Telegraphy, Aeronautics, and War," showing not only the world's cable system, but also (1) both past and prospective "wireless" stations, (2) suggested air stations. The map will be issued shortly by the publishers of the volume, Messrs. Constable and Co.

THE *University of London Press, Ltd.*, is about to issue "Everyman's Chemistry: The Chemist's Point of View, and his Recent Work told for the Layman," by E. Hendrick. The *Yale University Press* (and, in London, *Mr. Humphrey Milford*) will publish shortly "Human Nature and its Re-making," by Prof. W. E. Hocking.

OUR ASTRONOMICAL COLUMN.

VARIABLE STARS.—As many of the ephemerides of these stars that were formerly available are discontinued or inaccessible owing to the war, M. Luizet has prepared a useful set of ephemerides for 1917, which is published in the *Journal des Observateurs* (vol. ii., No. 8). It comprises 124 stars of the Algol type, 18 stars of the β Lyræ type, and 33 stars of the δ Cephei type; the period and date of first minimum (or maximum) in each month of 1917 are given, and other data, which make it easy to calculate

intermediate minima or to extend the ephemerides to 1918 or later. The lists are practically confined to stars visible in European latitudes.

THE ORIGIN OF COMETS.—In an article which appears in the August issue of *Scientia* (vol. xxiv., p. 85), Prof. E. Strömgen gives an interesting account of the reasons for regarding comets as permanent members of the solar system. In recent years exact calculations have shown that comets which have appeared to traverse hyperbolic orbits, when in the neighbourhood of the sun, acquired the hyperbolic form in consequence of the perturbations to which they were subjected by the planets. It is accordingly concluded that comets belong to our system, and that the so-called non-periodic comets are merely comets which have very long periods. The possibility of a comet entering our system from without is not excluded, but it is stated that no case of this kind is yet known. By reference to the dynamics of star-clusters it is argued that, while remnants of nebulous matter would, in general, be retained within the systems formed by individual suns, those which originally occupied the intermediate spaces would escape from the galactic system on account of the high velocities corresponding with their small masses. On this view, comet-forming materials would not exist in interstellar space.

SOLAR PHYSICS OBSERVATORY REPORT.—The fifth annual report of the director of the Solar Physics Observatory, Cambridge, relating to the year ending March 31 last has been received. A study has been made of the South Kensington series of photographs of the spectrum of β Lyræ, and information has been gained as to the best epochs for further records with comparison spectra. Further investigations of the hydrocarbon-band lines in stellar spectra have indicated a sequence in which there is a gradual strengthening of the hydrocarbon lines from type F to type G, and a gradual weakening of the same lines from the G to the M type. Photographs of the sun's disc in calcium light were obtained on 161 days, and of prominences at the limb on 153 days; the disc spectroheliograms provide records for fourteen days which were missed in the Kodaikanal series. Numerous photographs of sunspot spectra were also obtained, and a comprehensive table of the affected lines recorded by various observers has been prepared. The necessity for a daily reference photograph of the sun's disc has led to the utilisation for this purpose of the image-lens of 60 ft. focal length which forms part of the McClean solar installation; by the use of slow bromide paper the photographs obtained have proved to be of greater value than was anticipated, inasmuch as they present the faculæ as well near the centre of the disc as near the limb. These photographs seem likely to be of special value in the elucidation of the relation between faculæ and flocculi. Investigations connected with the national defence have also been undertaken.

BRITISH SCIENTIFIC INSTRUMENTS AND PRODUCTS.

OF the lectures delivered at the British Scientific Products Exhibition, organised by the British Science Guild at King's College, a feature common to all is the disclosure of the backward state of the industries with which they were respectively concerned when the war broke out. In radiology the outbreak of war four years ago found a condition of unpreparedness in common with other branches of medicine. It was necessary to provide large quantities of new apparatus and the adequate staff for many new depart-

ments. This state of affairs was described by Dr. R. Knox in the course of a lecture on the practical uses of radiography; and the backward state of the industry which he described as prevailing four years ago is all the more remarkable when we remember that although the X-rays were discovered by Prof. Röntgen, the discovery, as Mr. A. A. Campbell Swinton, who presided at the lecture, pointed out, could never have been made but for previous scientific research carried out in England. Had it not been for the work of Faraday, the necessary high-tension electric currents would not have been available, while the Crookes high-vacuum tube with which the rays were produced was the result of the laborious and long-continued investigations of that veteran scientific explorer, Sir William Crookes, who, although eighty-six years of age, is still young enough to be an exhibitor at the exhibition. Mr. Campbell Swinton also pointed out that the two greatest advances made in connection with X-rays since their original discovery were due in large measure to professors at King's College, the original Crookes "focus" tube having been adapted to X-ray purposes by Sir Herbert Jackson, and the recently invented Coolidge tube, though brought out in the United States of America, was based on the experimental results obtained by Prof. O. W. Richardson, also of King's College, working on lines laid down by Sir J. J. Thomson, of Cambridge.

Though the industry associated with radiography is small, its importance is great and promises to become greater in the future. Dr. Knox stated that experience gained in the administration of X-ray departments on a large scale, such as had been possible during the past four years, had taught us the necessity for a standardisation of apparatus. Had this been achieved before the outbreak of war, as he considers it well might have been, the task of rapidly equipping numerous departments would have been easy and the standard of work done much more satisfactory than it has been under the conditions possible in war time. The lecturer emphasised the need for research in connection with the production of essential apparatus and X-ray tubes if we were to hold our own in competition after the war. Most important research work has been carried out in this country lately in connection with the accessory apparatus, and Dr. Knox stated that the intensifying and fluorescent screens at present in use are an advance on those we formerly imported from Germany. The manufacturers of X-ray plates have more than held their own, and the production of a trustworthy photographic paper upon which X-ray negatives may be produced directly is one of the achievements of the war period. The most striking of the recent applications of X-rays and radium described by Dr. Knox is that used by Mr. Percival P. Cole in connection with his operative work on injury to the face and jaws. Another new development in plastic surgery is also associated with Mr. Cole's name, the well-known depilatory power of X-rays having been used for the destruction of hair in portions of the scalp and face which are used in plastic surgery. Dr. Knox insisted more than once in the course of his lecture on the need for encouraging research and bringing about the co-operation of all interested in the work. He said that steps are in progress with the view of forming a British school of radiology and physiotherapy.

In describing advances in bacteriology during the war, Dr. C. H. Browning, director of the Bland-Sutton Institute of Pathology of the Middlesex Hospital, mentioned that the need to overcome the poison of sepsis in wounds had stimulated profitable investigations on the properties of flavine and other dye-stuffs as antiseptics. He emphasised the relation