if not the sole, excuse that could be adduced for Government support of a very substantial character to one firm only rather than helping a relatively large number of smaller concerns, which many now believe would have produced more immediately satisfactory results.

(7) In spite of manifold difficulties much has been done by universities and technical institutions of the higher order to help industry. Professors, lecturers, and post-graduate students have vied with each other in endeavours to meet many demands made upon them, and their collaboration with manufacturers has led in many cases to extraordinarily gratifying results. If all the facts could be published it would be a most agreeable surprise to many, who have taken an altogether too gloomy view of the possibilities of this collaboration. Leeds University and the Manchester School of Technology have started new departments for chemical research for special objects, such as the study of problems in connection with the dyestuff industry. Remarkably fine and eminently useful work has been carried out also for the Army and Navy. A great deal more could have been done in that direction but for the aforesaid shortage of well-trained chemists, the relatively small number of whom are at last "coming into their own." Salaries that would have been thought preposterously large a few years ago are now gladly paid. It is to be hoped that this will tend to attract to the profession a large number of suitable and able men as well as women. It may indeed be said that unless this takes place there is not much hope for the establishment and maintenance on an adequate scale of the dyestuffs and allied industries; and not only must those who have to deal with the scientific and practical side of the industry be chemists, but what is equally important, the men who direct the administrative side of the business must also be well-trained chemists of business experience, or good business men with a chemical training. It is facts such as these that are appreciated far less than they deserve to be. But the war is teaching us many things, and as we have perhaps at last realised the importance of the work of the chemist in war-time, so it is just conceivable that the nation may in time come to realise that in peace-time also industrial and material progress is going to depend more than it ever did before on the successful work of the chemist.

A. R.

PRESERVATION OF NATURAL COLOUR IN PLANTS.

SO long ago as 1908 Prof. J. W. H. Trail described in the *Kew Bulletin* a method which he had worked out for fixing the green colour in plants. By placing the plant for a shorter or longer period in a boiling solution of copper acetate dissolved in acetic acid, a combination of the copper salt with the chlorophyll was formed which rendered the colour permanent when the specimen was exposed to the light after drying or placed in a preservative solution such as alcohol.

The method deserves to be more widely known than it seems to be among those interested in preparing plant specimens for exhibition in museums or for lecture purposes. It is essentially a method the results from which gain by experience; different plants lend themselves to the treatment with different degrees of success, and require very different periods of treatment; the time for which it is necessary to keep the plant in the boiling solution varies from one minute to forty minutes, according to the action of the copper salt upon the plant. If the action is proceeding satisfactorily, a period of one to five minutes should suffice; the end of the operation is easily judged by the colour or by treating two different specimens for different periods; a specimen that by such comparison appears to require longer treatment can always be reimmersed to get the desired effect. Many plants, notably the leaves of evergreen shrubs, are more difficult and generally less satisfactory in the ultimate colour, probably owing to the presence of mucilaginous or decomposition products or tannins. These require long treatment varying from twenty to forty minutes; after the first immersion they turn yellowish, and then after a time the yellow gradually gives place to green, generally an olive-green. Other plants, notably Aucuba, fail entirely, as they pass from the yellow to a muddy-brown or black colour.

After treatment the plants should be washed (like photographic prints) in running water for about two hours. They are then dried under as light pressure as is compatible with keeping the plants from twisting, or, after shaking off as much water as possible, may be dried in hot sand. In many cases the plants are rendered so flaccid by boiling that sand-drying is difficult or impossible. Plants that have required long boiling not infrequently revert to a bad colour when sand-dried.

Young parts of plants green better than old; better results may be expected from "spring" leaves than from "autumn" leaves.

A stock solution is made by saturating commercial strong acetic acid with powdered copper acetate. For treatment, dilute the stock solution with water in the proportion of three or four parts of water to one of stock solution. The solution is heated in a non-metallic vessel, glass beakers being probably the most suitable, and wooden, not metal, forceps should be used for manipulating the specimens.

This method has been used at the Natural History Museum for some time past in the preparation of plants for exhibition purposes, and good results have been obtained with cryptogams as well as flowering plants; ferns especially give satisfactory results, and, as Prof. Trail has noted, fresh green Algæ can be successfully treated. Proceeding out of these investigations, experiments have been made with the object of preserving the natural colour of seaweeds or of intro-

ducing a colour that is natural and permanent. The exhibition of Algæ in the Botanical Gallery, which has been recently rearranged, shows an appreciable success for the red Algæ and some satisfactory results for the brown Algæ. It is proposed to present an account of these experiments shortly before one of the scientific societies.

A. B. RENDLE.

DR. J. O. BACKLUND.

ASTRONOMERS will hear with regret of the death of Dr. Backlund at Pulkova on August 29. He was a native of Sweden, having been born at Langhem, in Wermland, on April 28, 1846. He studied mathematics and astronomy at the University of Upsala, and in 1873 went to Stockholm Observatory as assistant to Prof. Gylden, whose new methods of perturbations he studied with enthusiasm. After a brief return to Upsala in 1875, he left Sweden for Russia, where he remained permanently. He was at Dorpat Observatory for three years, and in 1879 went to Pulkova as assistant to Dr. Otto Struve. On Prof. Bredichin's death in 1895 he was appointed director of the Observatory, retaining this post until his death.

Dr. Backlund is best known for his immense researches on the motion of Encke's comet, for which he received the gold medal of the Royal Astronomical Society in 1909. Encke had detected the acceleration in the comet's mean motion, which he ascribed to the action of a resisting medium. After his death in 1865 von Asten took up the research, adopting some of Gylden's methods. He was unable to represent the comet's motion by any constant value of the acceleration, and died at Pulkova in 1878 without solving the problem completely. Backlund took up the matter, receiving grants from M. E. Nobel and the Petrograd Academy of Sciences for assistance in computing the perturbations, which were redetermined from 1819 to 1891, and afterwards to 1911.

Backlund found clear evidence that sudden changes in the amount of acceleration took place in the years 1858, 1868, and 1895. He later found evidence of a fourth change about 1905; after this the acceleration had only one quarter of its value before 1858. He also studied the changes in brightness of the comet (it is generally brighter before than after perihelion), and made the tentative suggestion that its particles are flat and oriented parallel to a particular plane, so that when seen edgewise they reflect little light.

A valuable by-product was the determination of the mass of Mercury, the value being 1/9,700,000 of the sun. This mass cannot be found except by comets, for even Venus is not appreciably perturbed by Mercury. Several approaches of the comet to Mercury yielded accordant results.

Dr. Backlund showed great energy in administration; he found that the climate of Pulkova was unsuited for delicate astrophysical researches, and succeeded in establishing branch observatories at Odessa, and Feodosia, in the Crimea. He took part in the Russo-Swedish determination of an arc of the meridian, visiting Spitsbergen for this purpose. A valuable new method of determining the flexure of transit-circles was introduced at Pulkova under his auspices. In conjunction with Dr. Hough he formed a list of stars to be used as fundamentals in astrographical reductions, and arranged that the "Star Corrections" for several hundreds of them should be printed at Pulkova.

The British observers who visited Russia for the eclipse of August, 1914, remember with gratitude his kind help in the difficulties which arose from the outbreak of war.

NOTES.

WE notice with much regret the announcement, in the *Times* of November 6, that Prof. H. H. W. Pearson, Harry Bolus professor of botany, South African College, Cape Town, died on November 3, at Mount Royal Hospital, Wynberg, at forty-six years of age.

THE many friends of Major T. Edgeworth David, professor of geology in the University of Sydney, will be delighted to learn that he has recovered from the effects of serious injuries received while conducting mining operations in northern France, and hopes shortly to rejoin his regiment.

IN answer to a question by Mr. Montague Barlow in the House of Commons on October 26, suggesting the adoption of the metric system of weights and measures, the Prime Minister stated that he was aware that the proposal to adopt the metric system had a certain measure of support, but that it was difficult to say how far this was general. He understood that the attention of Lord Balfour of Burleigh's committee had already been directed to the subject. This reply will probably not be regarded as encouraging by those who are of opinion that the immediate obligatory adoption of the metric system is urgently necessary in order that we may be fully prepared, when the war is over, to cope with competition in foreign trade. Though the metric system has been legal for all purposes of internal and export trade for nearly twenty years, very little advantage has so far been taken of it by the trading community generally; while the large body of retailers are still completely ignorant of the nomenclature and equivalents of the system.

EMERITUS PROFESSOR JOHN FERGUSON, who last year resigned the Regius chair of chemistry in the University of Glasgow, died, after a very brief illness, on November 3. Prof. Ferguson was in his eightieth year, and had held the chair since 1874. His connection with the University had been continuous, as student, assistant, and member of the Senate, for well over sixty years. Among his pupils or assistants were Prof. J. M. Thomson, Sir William Ramsay, Sir J. J. Dobbie, Prof. G. Henderson, Prof. W. Lang, Prof. Carrick Anderson, Prof. M. A Parker, Dr. A. W. Stewart, and other distinguished chemists. He had made many contributions to the history of chemistry, to bibliography, and to archæology, the most notable being his "Bibliotheca Chemica," published in two quarto volumes in 1906. He was an LL.D. of St. Andrews, and an honorary member of many British and foreign learned societies, including the Imperial Military Academy of Medicine, Petrograd, and the Société Francaise d'Archéologie. Last year, on his retirement from the chair, he was appointed honorary curator of the