

and showed that such stars could be dealt with successfully. Hence it came about that velocity determinations have been accumulated for more than 500 stars, by the joint work of thirty-five observers, including Frost, Mr. Barrett, Mr. O. J. Lee and Dr. Otto Struve, who had joined the staff in 1922. Out of more than 4,000 photographs, Frost had taken about 9 per cent, Mr. Barrett about 37 per cent, Mr. Lee about 11 per cent, Dr. Struve nearly 23 per cent. Out of the 500 stars observed, 187 or 37 per cent were believed to be spectroscopic binary stars by reason of their observed variable velocities.

Besides editing in 1907 the solar observations of Dr. C. H. F. Peters made at Hamilton College, Clinton, N.Y. in 1860-70—a task involving labour out of all proportion, it must be confessed, to the scientific value or availability of the results—Frost published more than a hundred papers, mainly in the *Astrophysical Journal*, of which he was then active managing editor for twenty-seven years. Seven volumes of *Publications of the Yerkes Observa-*

tory have appeared recording the work of many workers in diverse lines of astronomical activity. No wonder that with so much editorial work in the daytime, his eyesight suffered when he imposed on it also the strain of observational work at night. It was on December 15, 1915, that detachment of the retina declared itself, and with cheerful belittlement of his affliction, he used to estimate the gradual diminution of the percentage of normal vision left to him as years went by. He resigned the directorship of the Yerkes Observatory in July 1932.

Frost will be remembered with respect and affection by his many students and colleagues as a man of peculiarly genial nature in human relations, of very varied interests—natural history, botany, music, literature—and for his amazing courage and cheerfulness in carrying on his life's work in spite of the affliction of increasingly defective eyesight. A large circle of friends will join in deep sympathy with Mrs. Frost and her family, and in good wishes for the success of Dr. O. Struve in carrying on the directorship of the Yerkes Observatory.

News and Views

Past and Future of Chemical Industry

In his medallist's address to the Society of Chemical Industry at Glasgow on July 3, Dr. E. F. Armstrong briefly reviewed developments in chemical industry in the last twenty-five years, with particular reference to his own experiences with Crosfield's and Gossage's. Noting the unpreparedness of chemical industry for the Great War, although chemists and chemical industry came well out of that searching ordeal, he urged the importance of maintaining in peace time in active being those industries which in war will furnish the plants, the materials and the chemists necessary for war production. Another war might make even greater demands on our chemical resources, and modern mass-production plants cannot be improvised. Apart from the ability of the industry to expand rapidly to supply war needs, the availability of the technical personnel capable of handling intricate manufacturing processes as well as emergency problems is even more important. Dr. Armstrong directed attention to the tendency towards continuous processes, automatically controlled, and viewed with anxiety the future position of important products still made in Great Britain by batch processes. He referred to the systematic work required to secure the best results when a particular aggregation of plant has to be adapted to making several substances in turn, as in the colour industry, and briefly discussed the rationalisation of chemical industry as well as the formation and work of the Association of British Chemical Manufacturers and the effect of tariff changes on chemical industry.

LOOKING to the future, Dr. Armstrong advocated changes in the management of the Society of Chemical

Industry, including a recognition of the ephemeral character of most of the meetings, papers and discussions, and a much stronger participation in public affairs by the chemist. The training of the chemist in industry is not finally complete without some study of management, and it is essential for the chemist to realise that management can be scientific, and although nothing can substitute personality a thorough knowledge of a subject is equivalent to power. Labour questions offer an important field for experiment in which chemical industry has already pointed the way, and a reduction in working hours, a later entry into industrial life as well as an earlier departure are all matters obviously desirable from technical as well as social and economic points of view. Dr. Armstrong made a powerful plea for more attention to the problems of the smaller firms, which could frequently be solved by closer co-operation particularly in development. It is probable that, in the future, allied industries will tend to become more and more chemical manufacturers, and the importance of the chemist thus to increase. Technical men must prepare themselves to meet the situation; there is a suspicion that the individual chemist has not progressed individually with his industry. It is essential to attract the best type of young men and to see to it that they are encouraged and adequately rewarded from the start.

Ecological Expeditions in East and West Africa

THE Department of Botany at the British Museum (Natural History) has received 838 plants collected on the Cambridge Botanical Expedition to Nigeria by Messrs. P. W. Richards and R. Ross. The main object of the expedition was to make an ecological

survey of a limited area of West African rain-forest comparable with those previously made by Mr. Richards in Guiana and Sarawak. This meant a study of the floristic composition and structure of various types of primary forest on one hand, and a study of soil and micro-climatic conditions on the other. In addition, Mr. W. J. Fletcher Cambell made a general soil survey. Mr. Ross studied the succession of secondary forest on old farms and Mr. G. C. Evans worked on the growth, transpiration and assimilation of two species of undergrowth shrubs. The base camp was about five miles from Akilla in the Shasha Forest Reserve, Ijebu Province, and the area worked was mostly within a radius of five miles from the camp. Four months were spent here, and a visit, via the creeks, was made for a fortnight to Nikrowa in the Okomu Forest Reserve, Benin Province, where the rain-forest is said to be the finest in Nigeria. Collecting was mainly incidental to ecological work. The specimens are particularly rich in forest trees, and special attention was paid to Bryophytes. It was possible to fix a hygrothermograph in a tree top eighty feet from the ground in primary forest and to take daily readings over a period of several weeks. A mud and bamboo laboratory was built with a dark room quite efficient for working with panchromatic plates.

THE collection of plants made by Mr. P. M. Syngé on the British Museum Expedition to Uganda and Kenya has been received; it contains 1,231 numbers. Mr. Syngé's main object was the study of vegetational zones in the higher parts of the East African mountains and the environmental factors influencing them. Particular attention was paid to the arborescent Senecios, and a long series was collected. Some observations were made on humidity and temperature in the higher zones, but a complete record could not be obtained. Dr. Taylor made the main collections on the joint visits to the Aberdare Mts. and Birunga Mts. Three visits were made to Mt. Elgon and one to Mt. Kenya, while the Nyamgasani valley on the south side of Ruwenzori was ascended and collections made up to the limit of vegetation. Some water plants and algæ were collected from the Nyamgasani lakes: a little collecting was also done in the papyrus swamp around Lake Kioga.

Archæological Exploration in Africa

PROF. LEO FROBENIUS, president of the Frankfurt Research Institute for Cultural Morphology, who has recently returned from his twelfth expedition to Africa, claims, it is said, that the results of his explorations in the Libyan Desert and the Sudan have now established the validity of his theories of the origin and direction of diffusion of the periods, or phases, which he distinguishes in the history of civilisation. It will be remembered that Prof. Frobenius, working on the material which he has been engaged in collecting in Africa for nearly thirty years, has not only produced an elaborate classification and scheme of distribution of the main forms of culture in that continent, but has also put forward certain views as to their historical development and

affiliations. In an interview with the correspondent of *The Times*, which appears in the issue of July 31, Prof. Frobenius is reported as saying that he has now discovered in the Neolithic of the Sudan, the period in which agriculture and the domestication of animals first appear, the missing, but essential, link in the chain of evidence joining prehistoric to historic cultures. It is further reported that, since October last, a staff of twenty research workers attached to the Institute and distributed from Scandinavia to Southern Rhodesia, including France, Spain, Italy, North Africa, Abyssinia and Arabia, has been engaged in filling in gaps in the evidence and adding details to the chart of cultural distributions, which is now approaching completion.

FURTHER particulars are now to hand of an archæological discovery in Tanganyika reported early in July. According to a dispatch from Nairobi in *The Times* of August 1, Commander Nino del Grande, leader of an expedition collecting snake poison for the preparation of a snake-bite serum, camped for five days on the site of the ancient city discovered near Nguruka. He reports that the city is four and a half miles long by one and a half miles broad and is constructed terrace-wise on the wall of the Great Rift escarpment. Remains of houses, estimated to number four thousand, were found. Each had three or four rooms and stone walls four feet in thickness. Large stone tombs, one containing a skeleton, were found in the valley below. It is given as the opinion of Commander del Grande that no very high antiquity is to be assigned to these remains. It is thought that they may be about five hundred years old and the work of an advanced tribe, possibly the ancestors of the Wambulu now living some fifty miles away. The site is being examined by Dr. L. S. B. Leakey, whose verdict on the relation of these remains to other vestiges of stone structures found in various parts of East Africa should be of signal importance for the cultural history of the southern half of the continent.

Excavations in the Fens

THE importance of intensive exploration of the Fens, which led to the formation of the Fenland Research Committee at Cambridge, under the presidency of Prof. A. C. Seward, has already been referred to in these columns. Some of the results already obtained are now on exhibition at the British Museum, Bloomsbury, at the head of the main staircase. The sites selected are mostly between March and Mildenhall, and more or less connected with the Ouse, Cam and Bedford Rivers, where the post-glacial period is represented by peat, clay and silt, in which a sequence of human occupations can be traced, while light is further thrown on land movement and forest development. Waterways and promising sites have been traced by surveying on the ground and from the air, and an interesting feature is the occupation in Roman times of what used to be river banks but are now parallel mounds flanking slight depressions, in which shrunken rivers originally flowed. The contraction of the peat