Imperial Botanical Conference.

THIS conference, the first of its kind, was held at the Imperial College of Science and Technology, South Kensington, on July 7-16, under the presidency of Sir David Prain. It was attended by a large number of overseas and home botanists, and many interesting topics were discussed.

PLANT PHYSIOLOGY.

In the Section of Plant Physiology, Dr. F. F. Blackman organised an extremely illuminating discussion on "The Physiology of Crop Yield." In the general introduction to this discussion he indicated the five chapters of modern scientific investigation which combine to illuminate the problem of crop yield. The first dealt with the experimental study of the factors and conditions affecting growth, and was illustrated by papers from Dr. F. G. Gregory on the study of plant growth with controlled artificial light, and from Prof. V. H. Blackman on the results of electro-culture experiments. The second chapter concerned the ontogeny of the crop and duration of the development sequence. It was pointed out that crop-yield covers a wide range of special cases, the desired crop being either the whole plant, its wood, fibre, or bark, or some special morphological part, such as the petals, stamens, fruit, or seed hairs. The desired part comes at the end of a long development sequence, and, for this aspect of crop yield, detailed studies are required of the normal sequence of development of each crop plant combined with an exploration of its plasticity under natural and artificial variations of environment. Other problems arise out of the varying duration of the development sequence in the individual crop plants. These were illustrated by Dr. W. L. Balls' account of his method for analysing the development of the cotton plant by collating records of the significant stages prior to the production of cotton. The next chapter dealt with the quantitative relations between the final yield and the various "factors" which affect the development of the crop plant. Several investigators, notably Mitscherlich, have tried to formulate a general law governing the relation between the plant yield and the magnitude or intensity of all outside factors, but Mr. G. E. Briggs showed the inadequacy of such formulæ.

The fourth phase of this symposium treated of the complexity of the plant's spatial environment, namely, the soil, and was illustrated by Mr. E. J. Maskell's account of critical pot-culture work at Rothamsted. Lastly, the influence of the weather on crop yield was considered, and the great difficulty of disentangling the effects of the various components of the weather was pointed out. Dr. R. A. Fisher showed that by the methods of statistical analysis significant relations between weather factors and yield can be computed where a sufficient mass of data is available. In the general discussion which followed the presentation of the main thesis, Mr. F. L. Engledow drew a comparison between a tillering plant, such as wheat, with a non-tillering plant, such as cotton, as regards development sequence and its effect upon crop yield. Dr. H. M. Leake directed attention to the enormous influence of rainfall upon plant growth in monsoon countries, owing to the elimination of temperature as a limiting factor.

GENETICS.

In the Section of Genetics, Mr. F. L. Engledow opened a noteworthy discussion on "The Economic Possibilities of Plant Breeding," Mr. W. Bateson being in the chair. Mr. Engledow confined his attention chiefly to the possibilities of hybridisation in the English wheat crop. He pointed out that the economic possibilities of breeding are measured by the prospects of producing new forms which will give better financial returns than the old. Enhanced returns may accrue from higher yield, better quality, and a number of other amenities, many of which indirectly affect yield and quality, and all influence financial return. Quality improvements, such as those exhibited by the varieties Yeoman and Yeoman II., produced by Professor Biffen, have great promise. Improvement of yield is more difficult, as the average yield of wheat per acre is already higher in England than in any other country. The best policy is to try to identify the plant characters which mainly govern yielding capacity, and then by synthetic breeding to produce optimum combinations of these characters suitable for different localities. Among "other amenities" are the qualities of disease-resistance, non-lodging, early ripening, and winter hardiness, all of which are of great importance, and the attainment of which seems reasonably possible. Dr. R. N. Salaman dealt with similar problems in potatoes, Mr. M. A. Bailey dealt with cotton, and Mr. J. M. F. Drummond with oats and turnips. In the other session devoted to genetics, Prof. J. Percival opened a discussion on "The Value of Selection Work in the Improvement of Crop Plants," to which contributions were made by Prof. R. G. Stapledon, Dr. W. L. Balls, Mr. G. O. Searle, and Mr. G. N. Sands.

PLANT PATHOLOGY AND MYCOLOGY.

Much attention was paid at the Conference to problems in plant pathology and mycology. Dr. A. W. Borthwick opened a discussion of much interest on the "Relation of Forest Pathology to Silviculture," in which an appeal was made for closer co-operation between the practical cultivator and the pathologist, and for the latter to confirm his laboratory investigations by further research in the forest. Mr. W. E. Hiley stressed the importance of the non-parasitic agencies which frequently cause severe mortality in seedling trees and loss of increment during later stages of growth. He urged the need of a careful study of the particular edaphic and climatic requirements of the various species used for forestry purposes, indicating that in the absence of complete suitability the trees often die or grow slowly, and are more than usually susceptible to parasitic attack. Dr. J. W. Munro and Dr. Malcolm Wilson also contributed to this discussion. Another session in this Section was devoted to a discussion on "The Relation of Plant Pathology to Genetics." This was introduced by Mr. F. T. Brooks, who summarised recent achievements in breeding disease-resistant varieties of crop plants, and pointed out the limitations of this method of disease-control. He stressed the importance of co-operative effort between plant pathologists and geneticists. Prof. Groom dealt with "Fungal Attacks on Timber," indicating the enormous losses which occur, and urging the need for more intensive research upon the problems involved. There were also interesting discussions on "Bud-rot of Palms," "Mosaic Disease of Sugar-cane," and "Brown Bast Disease of Rubber Trees."

SYSTEMATIC BOTANY AND GEOLOGY.

In the Section of Systematic Botany and Ecology, Dr. A. W. Hill opened a discussion on "The Best Means of Promoting a Complete Botanical Survey of the Empire." The present position of the Botanical Survey of the Empire was reviewed, and attention

was directed to the most pressing needs of the moment. It was pointed out that in some regions, such as India, Malaya, and South Africa, great progress had been made in the systematic study of their floras, but that in others, such as East Africa and some of the West Indian islands, little had yet been done to explore the vegetation resources. In urging that further facilities should be afforded to British botanists to go out and explore the floras of our overseas dependencies, Dr. Hill stated that at present we were indebted chiefly to foreign botanists for a knowledge of the plants of some parts of the Empire. A strong appeal was made for temporary interchanges of posts between overseas and home botanists. The value of a detailed botanical survey was emphasised, especially from the point of view of the economic resources and possibilities of the Dominions, Colonies, and Protectorates.

Another important and closely allied subject dealt with at the conference was the consideration of the best means of promoting the study of natural vegetation of the Empire in its ecological aspect. This was introduced by Mr. A. G. Tansley. It was pointed out that the modern study of vegetation regards each kind of plant covering, be it forest, scrub, or grassland, as having a natural life, economy, and history of its own. If a given type of vegetation is sufficiently well adapted to the local climate and soil, not threatened by the invasion of plants better adapted to all the conditions, and undisturbed by man, it will maintain itself indefinitely. Many kinds of vegetation are, however, mere transition phases to other types, which gradually replace the former covering by the natural invasion of individuals of different species, as, for example, when new soil, such as the alluvium of a river, blown sand, or the like, is occupied first perhaps by grasses, then by shrubs, and finally by trees. Again when forest is felled or burned, or when grassland is burned or overgrazed, new plants, often resulting in a different type of vegetation, invade and settle in the area. The original vegetation may or may not ultimately return. All these phenomena of the development of vegetation are referred to as "succession."

Such facts have, of course, long been well known to practical foresters and stock-raisers, but their systematic investigation is a modern study, vigorously pushed forward, especially in the United States, and also in some of our own colonies and Dominions, especially in New Zealand and South Africa, and to some extent in India and Burma. The results have proved most valuable as a practical guide to the treatment of the land. Overgrazing, for example, may greatly lessen or even destroy the value of a cattle range, by crippling the vegetative powers of the dominant pasture plants, and thus letting in less valuable or worthless herbs, "throwing back the succession" to an earlier stage. The range then has to be allowed time to recover by the natural succession of the grasses and other pasture plants which originally occupied it. A carefully regulated system of grazing or burning will maintain the most useful phase of the succession. The first step towards the discovery of the most scientific and therefore the most economical and productive treatment is the careful and thorough study, by trained investigators, of the natural composition, behaviour, and succession of the vegetation. This has been amply proved, to mention but two examples out of many, by the work of Sampson in the United States and of A. H. Cockayne in New Zealand. The laws of behaviour of forests, on which alone can be based the most scientific treatment, are subject to quite similar laws, and a marked feature of this part of the Conference was the hearty support given by men with long practical experience of forestry work, such as Prof. Troup, of Oxford, who was for many years a member of the Indian Forest Service, and by Mr. R. S. Hole, for some years botanist at the Forest Research Institute at Dehra Dun, to the proposals of the conference.

After very brief summaries of the present state of knowledge of the vegetation of the Crown Colonies and Protectorates, and of the Dominions, and a series of papers from representative men of experience of such work in different parts of the Empire, there was a general discussion, concluding with resolutions. These aimed at the creation of a small central body to superintend the preparation of a series of outline monographs on the vegetation of the different parts of the Empire. Though our knowledge is still, of course, very incomplete, it is of great importance to collect and present what we do know in accessible form, which will serve as a starting-point for further work. It is further proposed to arrange for the systematic record of future work uniform with the monographs. It is also proposed that the central body, when formed, should at once put in hand the preparation of a pamphlet or small handbook, co-operatively produced by the best available authorities in the Empire, dealing with the aims and best methods of field work in the study of different kinds of vegetation, so that a practical guide may be available for new workers in this field throughout the Empire. The conference also adopted a resolution that an adequate training for work on vegetation should involve a practical training in systematic botany and ecology by competent teachers in the field.

At the closing session of the conference Prof. F. O. Bower gave a striking address on the training of botanists, the possibility of effecting interchanges of staffs, and the need for further facilities for research, which was followed by an animated discussion.

The conference terminated with a hearty vote of thanks to Sir David Prain for presiding over its labours.

F. T. BROOKS.

The Maximum Recorded Temperature of the Air and its Circumstances.

IN the midst of the semi-desert plain of Jefara, between the coast of Tripolitania and the interior plateau, there exists an official Italian settlement situated about 25 miles south of Tripoli and 25 north of Gharian at some 300 feet above sea-level, known as Azizia. In 1913 Prof. Filippo Eredia, as a member of an agricultural commission, visited the locality, and wisely saw to the establishment of a meteorological station on the lines followed at many other points in the colony. He took great pains to ensure the accurate functioning of the instruments after approved methods, and has recently published the results for a period of seven, not, however, consecutive years: 1913, 1914, 1915, 1919, 1920, 1921, 1922. (Ministero delle Colonie. Sul Clima di Azizia (Tripolitania), Rome 1923.)

The mean yearly temperature for this period is 70·8° F. (21·6° C.), not an excessively high figure, but appropriate to the latitude well outside the northern tropic, the range being between 87·4° F. (30·8° C.) in July and 52·8° F. (11·6° C.) in January. Therefore, though the summer is torrid, there is a very decided cool season, slight frost being occasionally experienced with an absolute minimum for the period in question of 31·1° F. (−0·5° C.) in December. Maximum temperatures as high as 110° F. (43·3° C.), the figure