

The administration of the engineering foundation is conducted by sixteen members elected by the United Engineering Society, thirteen of whom must be members of the founder societies. Although finally organised only in the early part of 1915, the foundation has become thoroughly established, and is carrying on a most admirable work.

A. P. M. FLEMING.

### African Softwoods for Pulp Production.

By A. H. UNWIN,

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ABOUT the year 1907, at the instigation of the late Sir Alfred Jones, an inquiry was addressed to the West African Colonies with regard to the softwoods suitable for paper or pulp production. As a result a list was compiled for the Benin country, which included some twenty species of whitewood. Since that date little or nothing has been done towards the solution of this problem. Nevertheless, much greater knowledge has been obtained of the softwoods of the West African Colonies—the Gambia, Sierra Leone, Gold Coast, Nigeria—and of West Africa generally.

Although baobab (*Andansonia digitata*) has been suggested as suitable, it is usually found rather remote from navigable waterways, and in such scattered quantities that it is doubtful if its exploitation will pay. On the other hand, the wood of the cotton-tree, *Eriodendron anfractuosum* and *E. orientale*, has been adversely reported upon, but it does not appear that very exhaustive experiments were made with either of these species. The ease of its production, the rapidity of its growth, and the softness of its wood would seem to commend the cotton-tree for pulp production. The wood of *Bombax buonopozense* may also be of use.

Perhaps a more suitable wood will be obtained from the African maple, *Triplochiton Johnsonii* and *T. nigericum*. The wood of both these species is of about the same hardness as that of spruce. It is of a similar colour, and the fibres are long. The tree is very prevalent, its reproduction easy in the proper localities, and its growth rapid. On average soil the trees reach pulp-wood size within ten years, and there are many specimens even in seven years.

In certain localities the occurrence of *Sterculia Barterii* is such as to redden the hill-sides with its flowers in March. The growth of the tree is very rapid, and the wood is fibrous and porous. The tree will attain pulp-wood size in five years. In suitable localities the natural reproduction from mature trees is rapidly filling the whole forest.

Other *Sterculiæ*, such as *tomentosa*, *rhinopetala*, and *tragacantha*, might be used. Of these the last-named appears to be the most suitable. It is also very prevalent, and grows rapidly. The wood of *Sterculia rhinopetala* may prove to be a little hard, but with modern means of pulping it may be possible to use all these species at the same time.

The quantity of bamboo on the West Coast of Africa is negligible though the area of its distribution is gradually widening.

The *Albizias* usually produce in their younger stages a whitish-yellow softwood. Most species grow very fast, and would yield pulp-wood within ten years. The wood shows long fibres. Owing to the prevalence of the tree in the forests, there would be no difficulty as to the quantity. The wood of *Terminalia superba* should prove of value, though its brownish tinge may have to be removed in order to make the best-coloured pulp. It is prevalent and its growth is rapid.

Another very common tree is *Alstonia congensis*,

which is often found in the swamps as well as in the moist forests. Its growth is very rapid, and it would yield pulp-wood in seven years. Owing to its prevalence, this softwood with its longish fibre should prove of value.

The wood of *Ricinodendron Heudelottii* appears to be suitable, though the colour is dull grey-brown. The tree is very prevalent, and its natural regeneration prolific. It reaches pulp-wood size within a period of seven to ten years. *Pycanthus kombo* is another tree which appears to yield a suitable species of timber. It is very prevalent, the wood is soft and fibrous, and natural reproduction is great. Even the much-despised *Musanga Smithii* might on occasion be used to supplement inadequate supplies of other pulp-wood timbers. Near the rivers in some districts there is a common tree named Otu, which is planted by the natives. It yields a soft whitewood which has a longish fibre.

With the great shortage of paper-pulp it appears that the utilisation of these West African species of trees should be undertaken as soon as possible. Naturally, it will mean a good deal of experimental work, but with the experience already gained in Canada and Norway and Sweden it should be possible to produce pulp below existing cost. Although African labour is expensive as compared with Indian or Burman, it has proved itself thoroughly adaptable to training in the use of complicated machinery such as that employed in shipbuilding and in oil- and saw-mills.

With a population of about sixteen millions of people in Nigeria alone, it has been found possible gradually to obtain sufficient men for a new industry.

### Effect of Topography on Precipitation in Japan.

CONSIDERABLE attention has been directed recently to the subject of the orographical distribution of rainfall, and results obtained in different places are liable to lead to general deductions, not only independent, if not quite contradictory, but also, on the face of them, improbable. We may instance an alleged connection between Indian monsoon intensity and the extent of local water surfaces, and also M. Mathias' cartographical demonstration that the increase of precipitation with altitude is directly dependent on the latitude, at any rate in France. Mr. Carle Salter's lecture to the Institution of Water Engineers on the relation of rainfall to configuration gave little ground for suspecting either of these possibilities.

At first sight, Prof. Terada's contribution in the Journal of the College of Science, Tokyo Imperial University (vol. xli., art. 5), appears to be only a supplement to previous work of Profs. Nakamura and Fujiwhara, but one or two comparatively fresh notes are struck. Prof. Omori had previously found a correlation between earthquake frequency in some districts and precipitation in others. This is now described by Prof. Terada as a case more of parallelism than of cause and effect, for he prefers to attribute both phenomena to barometric changes rather than to associate the instability of the soil with percolation. His main purpose, however, is to study the effect of the discontinuity of wind velocity on land and sea, and for this purpose he divides Japan into six districts, three facing the ocean and three the Japan Sea, and in each district chooses two or three stations near the coast.

The three "ocean" divisions show a marked increase in rainfall with decreasing latitude, but on the con-

tinental side the middle section is the wettest. Moreover, taking the divisions in pairs, there is a marked difference in the comparison. In the northern and central pairs the "continental" section is the drier, while in the remaining pair the difference is greater and also reversed in sign. Prof. Terada connects this anomaly with a possible "centre of action" controlled by the position of the Korean promontory, but it seems to be quite possible that he has overlooked the probable effect of the contour of the land itself. A glance at the map will show that his southernmost "ocean" division is practically outside the main island, which includes the northern and central divisions and the greater part of the continental southern division, so that we should naturally expect some sort of anomaly in that region, apart from the fact that the vertebral line of division, which is not far from a meridian in the north, tends to become more nearly a parallel in the south.

The author has adopted a good plan in using percentages instead of totals to prevent undue emphasis being placed on the wettest periods and places.

W. W. B.

### Economic Entomology in the Philippines.<sup>1</sup>

A CONSIDERABLE portion of the Bulletin before us is the outcome of work undertaken with the definitely economic object of procuring and transporting to the battlefield natural enemies of the beetle *Anomala orientalis*, which, by reason of the havoc wrought in the larval stage on the roots of the sugarcane, is a serious pest in the plantations, and was causing heavy losses in the Island of Oahu, Hawaii. It is gratifying to learn that the quest of the entomologists was entirely successful, and that through their labours the foe appears to have been vanquished, and thereby all mankind benefited in the saving of large quantities of one of our most valuable articles of food. The ally which the entomological staff summoned to the aid of the sugar-planters was the "wasp" *Scolia manilae*. It is perhaps prudent here to indicate that the term "wasp studies" must not be understood to apply solely to the true Diplopterous wasps, the Vespidae; it is used in this publication as a convenient term including many families of aculeate Hymenoptera other than the bees.

*Scolia manilae* is a small black and yellow wasp that occurs abundantly in the Philippines. The females possess the power of detecting the presence of certain subterranean beetle grubs, and, having located their victim, dig down to it and deposit on its ventral surface an egg from which there soon emerges a larva that devours the beetle grub. The plan of campaign was simple. At Los Baños quantities of females of *Scolia manilae* were captured and placed in suitable vessels in which had been placed beetle grubs of appropriate age, and a sprig of foliage moistened with water and honey for the personal benefit of the wasps. Most of the grubs duly received an egg; those so favoured were placed in clay cells which were packed in soil in a tightly closed can, and then shipped to Oahu. Here the *Scolia* of the next generation emerged and were liberated. They established themselves with such success and increased so rapidly that they are now more abundant near Honolulu than at their native place, Los Baños, while the pest

*Anomala orientalis* is vanishing so satisfactorily as to cause wonder how the wasp maintains itself.

The authors describe and figure twenty-six new species belonging to several different families of "wasps"; and the bionomics of these and others are narrated with great detail by Dr. Williams. His observations show that many species of these "wasps" are of economic importance in keeping in check the numbers of harmful insects, and suggest that an important line of research is here open to the field-naturalist. From the purely scientific point of view, perhaps the most interesting feature of the Bulletin is the frequency with which instincts and behaviour that are characteristic of the most highly developed social wasps manifest themselves sporadically and in an incipient fashion among these solitary species. So much is this the case that it becomes almost possible to construct a gradually ascending series from the simplest to the most highly specialised. Commencing with species that differ but little in habits from the Ichneumonidae, stinging and only temporarily paralyzing their victim in order the better to attach their egg, but constructing no nest or burrow of any description, we may pass on to those that dig burrows or build nests either unaided or in company with a few other individuals, and reach the climax in the elaborate domestic arrangements and architecture of our familiar social wasps and hornets. O. H. L.

### Climate of the Netherlands.

THE Royal Netherlands Meteorological Institute has recently issued, as publication No. 102, "The Climate of the Netherlands with Respect to Air Temperature," by Dr. Ch. M. A. Hartman. Many years have elapsed since any previous discussion of air temperature in the Netherlands was undertaken. The stations yielding observations only for recent years have been compared with the stations available for longer periods, by which, together with the aid of stations affording hourly observations, special corrections have been found for each month and for each station required to secure the true temperature from observations at the hours of 8, 2, and 7. At Zwanenburg, situated midway between Amsterdam and Haarlem, there is a series of observations from 1743 to 1860, and at De Bilt observations are available from 1849 to 1917. The annual variation is given for twenty-four years from 1894 to 1917 inclusive at twelve stations; the range of temperature varies with latitude and with an increased distance from the sea. Diurnal variation is much affected by the influence of the sea, which suggests the difficulty of obtaining a true mean temperature from a combination of, say, three hours, 8, 2, and 7, and of maintaining the same hours in winter and in summer, but a change of hours is recognised as not practicable. The highest temperatures observed are 99° F. and 97° F. at Maestricht respectively on August 4, 1857, and July 28, 1911, and 97° F. at Oudenbosch on June 8, 1915. The lowest readings are -8° F. at Winterswijk on February 7, 1895, and at Katwijk-on-Rhine on February 14, 1895. Frequency of different temperatures is given for several stations and for all months, and the occurrences of diurnal variations of temperature for each degree Centigrade are tabulated, also the diurnal range for each of the twenty-four hours. One of the many tables shows the temperatures which occur each month, with the different directions of the wind.

<sup>1</sup> "Philippine Wasp Studies." Part i., Description of New Species. By S. A. Rohwer. Part ii., Descriptions of New Species and Life-history Studies. By F. X. Williams. Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association. Entomological Series. Bulletin No. 14. Pp. 186+106 figs. (Honolulu, December, 1919.)