

are seeking, I believe, without exception, to advance the material interests of those whom they represent. The claims which you put forward on behalf of experimental research would be wholly unselfish. They would be for work in the common interest, in the interest of mankind. In the report for the year there is a very long list of work done in different departments of scientific research with small sums like 10l. or so given out of your small Government grant to meet expenses. It is a list capable of indefinite expansion, and indicates work that might be done on a larger and more fruitful scale. Undertakings like the Research Commission to Uganda may well return their cost a hundred-fold, and I venture to suggest that an appeal should be made to those in charge of the Development Fund to give a wider scope to your disinterested and most beneficent activities."

COTTON GROWING WITHIN THE BRITISH EMPIRE.

THE British Cotton Growing Association was inaugurated in 1902 with the object of extending the cultivation of cotton throughout parts of the British Empire where conditions should prove suitable. During the eight years that have elapsed, valuable information has been acquired by means of pioneering expeditions and experimental cultivation in more remote parts of the Empire and from the results yielded by private undertakings that have been liberally assisted with technical advice and financial means. As it was announced a year ago, the inquiry stage is practically completed, and it has been decided to concentrate the main efforts of the association on the work in Nigeria, Uganda, Nyasaland, and the West Indies. The present state and future outlook of the cotton industry are therefore opportunely summarised in the address delivered by Mr. J. H. Reed before the Royal Geographical Society on Monday, December 5.

The principal supply of raw material from the United States of America has increased during the last quarter of a century from seven to thirteen million bales per annum; the output of India may reach a total of five million bales, but most of it is short-stapled, and Egypt supplies somewhat more than a million bales. Against this has to be placed the demand for cotton, which in this country has remained nearly stationary, at a total of three million bales, while the United States of America now require nearly five million bales, and the countries of Europe absorb six million bales. With regard to other sources of supply, the class of cotton grown in the West Indies is of good quality, but owing to the limited area the amount produced can never be large, so that the most hopeful fields for the labours of the association lie in West and Central Africa. The colony of Lagos bids fair to produce an appreciable quantity of cotton; the extension of the industry in Nyasaland, where a superior type of upland is a prominent variety, is distinctly encouraging, and the late High Commissioner of Uganda has reported upon the favourable climate and conditions, as well as the eagerness of the natives in that Protectorate for taking up cotton cultivation. In the Sudan there are large areas of suitable land near the junctions of the Atbara and the Blue Nile with the main stream, in the province of Berber, and on the plains between the converging courses of the Blue and White Nile. Of the prospects in Rhodesia it is too early to pronounce a definite opinion, but the experimental work gives promise of the possibility of a native industry being developed under European guidance.

PESTS OF FRUIT TREES.

A FRUIT-GROWERS' conference was held, in conjunction with the National Fruit-growers' Federation, at Wye College, Kent, on December 2. Nearly six hundred persons, mostly fruit-growers in Kent, attended. The papers of scientific interest were read by Mr. F. V. Theobald, vice-principal and entomologist at the college, and by Mr. E. S. Salmon, mycologist.

Mr. Theobald dealt with the damage done to fruit trees by Thrips. At least three species of Thrips damage fruit trees and bushes, the commonest, apparently, being *Euthrips pyri*, Daniel. This species is found on apple,

pear, plum, raspberry, loganberry, and strawberry. The winged adult females first enter the opening buds, and then by means of their conical mouths so lacerate the young tissue that the buds die soon after opening. Leaves and blossoms are also attacked. The ova are laid in slits cut by the female in the young leaves and strigs. The pale, wingless larvæ attack the young fruitlets, which either crack and drop off prematurely, or, if less injury is done on somewhat larger fruitlets, the abrasions lead to the formation of areas or scars, which disfigure or even entirely ruin the fruit. The larvæ when mature enter the soil, and there produce a pupal stage with long wing buds, and the winged Thrips appear again. The winter is passed in the larval stage in the earth. Treatment with soil fungicides appears to be the only practicable method of dealing with this fruit pest.

Mr. E. S. Salmon dealt with the epidemic outbreak of *Eutypella prunastri*, which during the past few years has destroyed thousands of young fruit trees in certain districts in Kent, Herefordshire, and Worcestershire. In one case near Canterbury 1200 "Victoria" plums, 300 "Czars," and 50 "Monarchs" were attacked and killed. The variety of plum called "Rivers Early Prolific" appears to possess powers of resistance to *Eutypella*. Young apple and cherry trees have also been destroyed by this disease.

The life-history of the apple "scab" fungus (*Venturia inaequalis*) was dealt with, and instances were given which showed that this disease can be successfully prevented by the use of the fungicide known as "Bordeaux mixture." The statement sometimes made by growers that the "scab" fungus can infect and spread on stored apples is due to an error of identification. Recent investigations made by Mr. Salmon show that we have in this country a species of *Leptothyrium*, not hitherto reported, which attacks apples both on the tree and in the fruit-room, and forms sooty-looking spots on them. It is probably the species *L. pomi*, well known in America as the cause of the "sooty blotch" and "fly speck" diseases.

Evidence was adduced as to the different degrees of susceptibility to injury from Bordeaux mixture shown by different varieties of English apples.

THE DISCOVERY OF NEPTUNE. LEVERRIER'S LETTER TO GALLE.

WHILE so much has been written about the dramatic discovery of the outermost known planet, it is strange that until quite recently the full text of the letter in which Leverrier announced to Galle the results of his wonderful investigations appears not to have been published.

A copy of this historic document was communicated by its recipient to Dr. See about five years ago, for use in a work on the planetary system which the latter was then preparing. But the death of Galle in July last has prompted Dr. See to anticipate the issue of his work by publishing the letter by itself in No. 8, vol. xviii., of *Popular Astronomy* (October, p. 475). The ostensible reason for writing to Galle was to acknowledge the receipt of the memoir which the latter had prepared, and in which he had reduced and critically discussed Roemer's synopsis of three days' work, which alone escaped the conflagration of 1728, under the title "O. Roemer's Triduum Observatorium Astronomicarum a. 1706 Institutum" (Berlin, 1845). The letter runs as follows:—

"Paris, le 18 septembre 1846.

"MONSIEUR

"J'ai lu avec beaucoup d'intérêt et d'attention la réduction des observations de Roemer, dont Vous avez bien voulu m'envoyer un exemplaire. La parfaite lucidité de Vos explications, la complète rigueur des résultats que Vous nous donnez, sont au niveau de ce que nous devons attendre d'un aussi habile astronome. Plus tard, Monsieur, je Vous demanderai la permission de revenir sur plusieurs points qui m'ont intéressé, et en particulier sur les observations de Mercure qui y sont renfermées. Aujourd'hui, je voudrais obtenir de l'infatigable observateur qu'il voulut bien consacrer quelques instants à l'examen d'une région du Ciel, où il peut rester une Planète à découvrir. C'est la théorie d'Uranus qui m'a

conduit à ce résultat. Il va paraître un extrait de mes recherches dans les *Ast. Nach.* J'aurais donc pu, Monsieur, me dispenser de Vous en écrire, si je n'avais eu à remplir le devoir de Vous remercier pour l'intéressant ouvrage que Vous m'avez adressé.

"Vous verrez, Monsieur, que je démontre qu'on ne peut satisfaire aux observations d'Uranus qu'en introduisant l'action d'une nouvelle Planète, jusqu'ici inconnue : et ce qui est remarquable, il n'y a dans l'écliptique qu'une seule position qui puisse être attribuée à cette Planète perturbatrice. Voici les éléments de l'orbite que j'assigne à cet astre :

Demi-grand axe de l'orbite	36,154
Durée de la révolution sidérale	217 ans, 387
Excentricité	0,10761
Longitude du périhélie	284° 45'
Longitude moyenne : 1 ^{er} janvier 1847	318° 47'
Masse	$\frac{1}{9300}$
Longitude héliocentrique vraie au 1 ^{er} janvier 1847	326° 32'
Distance au Soleil	33,06

"La position actuelle de cet astre montre que nous sommes actuellement, et que nous serons encore, pendant plusieurs mois, dans des conditions favorables pour le découvrir.

"D'ailleurs, la grandeur de sa masse permet de conclure que la grandeur de son diamètre apparent est de plus de 3" sexagésimales. Ce diamètre est tout-à-fait de nature à être distingué, dans les bonnes lunettes, du diamètre fictif que diverses aberrations donnent aux étoiles.

"Recevez, Monsieur, l'assurance de la haute considération de Votre dévoué serviteur

"U.-J. LE VERRIER.

"Veuillez faire agréer à Mr. Encke, bien que je n'aye pas l'honneur d'être connu de lui, l'hommage de mon profond respect.

"A Monsieur J. GALLE,
"Astronome à l'Observatoire Royal de
"Berlin, à Berlin."

THE NEW ZEALAND SURVEY.

IN a report which has recently been published, the Surveyor-General of New Zealand describes the work of his department during the year 1909-10. A large area of country has been surveyed, but the urgency for pushing forward the topographical and settlement surveys, and the survey of native lands, leaves little opportunity for dealing with the major triangulation of the country. It is satisfactory, however, to see that besides some 320 square miles of minor triangulation, a commencement of a secondary triangulation has been made, and a base-line some eight miles in length has been measured. There is said to be a pressing need for this form of control, which may "bring into harmony different groups of practically uncontrolled minor work with their different standards of length, &c." The experience of many other regions goes to show that not only is such control indispensable, but adequate expenditure on it is the best economy, and very soon repays itself.

As the report is arranged by districts, it is difficult to appreciate fully the character of work done; but the demand for land surveys on large scales is very large, and the want of ample and accurate triangulation of second- as well as the present third-order series is no doubt a real one.

The measurement of a base of the secondary triangulation at Wairarapa was carried out with two five-chain invar tapes; a third of greater width, a quarter of an inch instead of an eighth, was also used for the first two sections only. The tension was determined by a Salter spring balance, and not by weights, as is now the more usual method. The tapes were supported at intervals of fifty links by special stands. Four measurements were made of all sections, two with each tape, and of the first four two additional measurements were made; the probable error of the final value adopted for the base is given as 1 part in 2,962,000. The standard of length for

controlling the invar tapes was a steel 100-link tape, of which the true length was known at 62° F. and under a tension of 15 lb., but not its coefficient of expansion and modulus of elasticity. A second base is now in hand, and with the increase of this important high-grade work greater facilities for comparison and verification of base apparatus will doubtless be introduced. The work of the department also includes the harmonic analysis of the tidal observations of the Dominion for the New Zealand Nautical Almanac, and arrangements have been made to furnish advance proofs to the Admiralty.

The work of the magnetic observatory has provided an unbroken series of magnetograms from the Adie instruments, and also a large number of seismograms from the Milne seismographs.

THE JAPAN MAGAZINE.¹

THE great development of Western education in Japan has naturally led to the extensive publication of newspapers and magazines of a very varied kind, and many of them are of a high literary, scientific, or philosophical quality. *The Japan Magazine* is one of the most recent additions, and although its editor seems to be a European, almost all the writers are Japanese. The issue for October, which has just come to hand, is a very good combination of readable matter, which at the same time is of great interest to all who know Japan.

The first article is on "Torii," the characteristic and picturesque gateways to be found at the entrance to every Shinto shrine. It is one of the best which we have seen, and is illustrated by some of the most striking examples in the country. Mr. Seiichi Tejima, the director of the Higher Technological School in Tokyo, gives an interesting description of the organisation and work of his school which will be read with advantage by those engaged in similar work in this country. In addition to the technical part of the curriculum, the importance which is given to the training of character should be specially noted. Mr. Tejima points out that a person engaged in any occupation may be tempted to bargain his honour for venal purposes if the basis of his morals is not sound, and thereby lose the credit of an expert, and it is therefore the school's principal line of policy in education to give moral training on one hand and engineering practice on the other. Mr. Tejima was recently in London in connection with the Japan-British Exhibition, and no doubt some of our readers made his acquaintance and admired the exhibit shown by his school and other educational institutions in Japan. Viscount Taneko, the well-known statesman and writer, gives some readable reminiscences of American statesmen which throw interesting sidelights on some of the problems arising between America and the Far East.

The chief city engineer of Tokyo, Mr. Benjiro Kusakabe, has a descriptive article on "The New Tokyo," which gives a good idea of the transformation which has taken place and almost made the city unrecognisable by those who knew it in former times. Of course this magic transformation is, after all, not so marvellous as it appears, for the reconstruction of a city of wood cannot be regarded as so colossal a task as would be the rebuilding of a stone city like London or Berlin. But the story of the modernisation of Tokyo is none the less interesting as an indication of the tact, skill, and expedition with which the Japanese attempt and achieve great things, and Mr. Kusakabe thinks that when all the new buildings now either in course of construction or contemplated in the near future are completed, and the city's plan of public improvements carried out, Tokyo will be, both in appearance and reality, one of the finest capitals in the world.

Mr. Yaichi Haga tells "How Western Civilisation came to Japan," and Mr. Yoso Kubo, of the Investigation Bureau, has an important article on "The Remaking of Manchuria," which explains Japanese policy and methods in that part of the world. There are very good articles on "The Art of Judo," or of physical training, with special relation to its ethical aspects, on the "Silk Indus-

¹ Published by the Japan Magazine Co., Tokyo. Subscription, in Japanese Empire, per year in advance, 4.50 yen, in foreign countries 6.100 yen.