

of the remarkable progress of Canada since the visit of the British Association in 1884. Lord Rayleigh had, in allusion to that visit, described Winnipeg as the only city he knew where they ploughed up their streets to make them level. To-day Winnipeg had streets as good as those in London, and was thoroughly equipped in up-to-date institutions and modern conveniences of every kind. It was perfectly useless, he continued, for the unemployable, who could not or would not work, to go to Canada. There they would be absolutely lost, because everyone in Canada was a worker, but they gladly welcomed the genuine and willing worker in Canada, which was really as much England as was the Mother-country.

Sir David Gill, K.C.B., F.R.S., also responded, and said that in dealing with science and its application to practical affairs, there was not the least doubt that the temperament of men of science had been somewhat of a drawback in forcing scientific facts and principles upon the attention of mankind generally, as the man of science was apt to think he had done all he could do when he had found out scientific truths. He seemed to require something to aid him in forcing upon unwilling Governments that information which they were too ignorant to apply to national needs.

"The Guests" was proposed by Sir Frederick Pollock, Bart., and responded to by Mr. Roger W. Wallace, K.C., after which Sir Aston Webb, C.B., R.A., gave the toast of "The Chairman," to which the latter gracefully responded, thus concluding the proceedings.

CLIMATOLOGICAL REPORTS.

THE director of Chemulpo Observatory (Dr. Y. Wada) has issued the mean annual results of the valuable meteorological observations made at the Japanese stations in Corea in 1906-7 (see NATURE, April 1, 1909). The following are some of the results of air-temperature and rainfall for 1907:—

Station.	Chemulpo	Fusan	Wonsan	Mokpo	Song-chin	Yongamp
Lat'itude, N. ...	37° 29'	35° 6'	36° 9'	34° 47'	40° 40'	39° 56'
Longitude, E. ...	125° 22'	129° 3'	127° 26'	126° 22'	129° 11'	124° 22'
Mean max.	15.1°	17.5°	16.8°	17.7°	13.2°	13.4°
Absolute max. ...	34.6	32.5	37.5	32.7	32.0	32.9
Month ... VIII	VIII	V	VIII	VI	VII	
Mean min.	7.2	9.8	6.0	9.8	4.1	4.3
Absolute min. ...	-14.5	-8.4	-18.1	-8.2	-21.4	-24.3
Month ... XII	II	II	II	II	XII	
Adopted mean ...	10.8°	13.6°	10.3°	13.1°	8.2°	8.6°
Total Rainfall ...	667.3	1021.2	1576.5	811.6	627.3	1029.6

The instruments and method of observation are the same as those at meteorological stations in Japan; temperatures are given in centigrade degrees and rainfall in millimetres. The mean temperature was practically normal, but the rainfall fluctuated considerably; the data for the normals for these stations only go back to March, 1904.

The report of the Mauritius Observatory for 1908 shows that the mean annual temperature, 73.6°, was practically normal; the absolute maximum was 89.1°, minimum 53.8°, maximum in the sun's rays 166.2°, on November 12. The rainfall, 62.43 inches, was 14.5 inches above the average of 1875-1908, but for the whole of the island, obtained from reports from sixty-five stations, the mean was 90 inches, being 7½ inches above the average. Six cyclones occurred over the South Indian Ocean; during one, between February 28 and March 4, very heavy rainfall occurred over the whole island, ranging from above 45 inches at Curepipe to 9 inches at Port Louis; the tracks of three of the cyclones have been determined. Ninety-four photographs of the sun were sent to the Solar Physics Committee, and particulars of fifty-four earthquakes were sent to the seismological committee of the British Association.

The report by Mr. Iyengar of meteorology in Mysore for 1908 embodies the daily and monthly means for the second-order stations at Bangalore and Mysore, and the Sh. a.m. observations, with their monthly means, at the third-class stations at Hassan and Chitaldrug. Over the province, as a whole, the temperature of the year was practically normal; April was the warmest, and December the coldest, month. The absolute maxima and minima were 102.1° at Chitaldrug (in May) and 50.1° at Hassan

(in December). The rainfall was deficient and very unequally distributed, the defect varying from 13 to 43 per cent.; in November and December there was practically no rainfall.

The report issued by the Egyptian Survey Department on the rains of the Nile Basin and the Nile flood of 1908 states that during that year rainfall was measured at eighty-eight stations in the Nile Basin, while that recorded at 118 other stations in neighbouring regions was studied in connection with the meteorological conditions of north-eastern Africa. On the whole, rainfall was deficient to the south of the equator, and the country between the Victoria and Albert lakes seems also to have received less rain than usual. On the Bahr el Jebel the annual fall was usually in excess, and in the plains of the Blue Nile some months were wetter than usual. The tables show the monthly and annual rainfall for 1908, and the means for other years so far as data are available. We have previously referred to the flood of 1908, which again reached its normal value after a series of nine low floods. An interesting chapter on earth movements at Lake Victoria is added to the report.

The report of the chief of the U.S. Weather Bureau for the fiscal year ended June 30, 1908, shows that the important work of that department has been carried on with great activity. The tables, which extend over some 390 pages, include, *inter alia*, observations made twice daily during 1907 at twenty-nine stations selected to cover as nearly as possible all sections of the United States showing distinctive climatic features, monthly and annual summaries at 188 stations, and records of excessive rainfall in short periods at stations furnished with self-registering gauges. In our issue of October 21, 1909, we directed attention to several matters referred to in the administrative report, from an advance copy published in the annual summary of the *Monthly Weather Review* for 1908. We may add that this report states that the officials of the Bureau are encouraged in giving popular lectures with the view of eradicating superstitions prevailing with regard to the weather, and that instruments and charts are now exposed in kiosks at various suitable places. The instruments comprise special forms of maximum and minimum thermometers, air thermometer, hair hygrometer, thermograph, and a special type of rain-gauge with dial indicator.

The "Meteorological Year-book" of the Deutsche Seewarte for 1908, which has recently been published, contains the results of observations at ten stations of the second order, hourly observations at Hamburg, Wustrow, Memel, and Borkum, and storm statistics at fifty-seven signal stations in the North Sea and Baltic whenever a gale was experienced over a considerable area, embracing not fewer than three of the stations. The appendices include the hourly means of wind velocity at Pillau (a seaport in eastern Prussia) for the period 1899-1908. The mean monthly values exhibit a minimum in July (4.09 m.p.s.), rising gradually to a maximum (6.29 m.p.s.) in December, and gradually decreasing again to the minimum.

From an excerpt from the "Bavarian Meteorological Year-book" for 1909 we learn that registering balloon ascents made at Munich in connection with the international scheme for the investigation of the upper air were not so successful as in some previous years, owing to unfavourable weather conditions and loss of the instruments used. Nevertheless, eighteen successful ascents were made, and the results have been very carefully discussed. Among the several interesting features shown by a preliminary summary of the results for the years 1906-9 we may refer to the mean altitude and temperature at the beginning of the upper inversion, arranged according to seasons, which were found to be as follows:—winter, 10,650 metres, -61.5° C.; spring, 9870 m., -54.9°; summer, 11,770 m., -57.2°; autumn, 11,790 m., -58.2°. The mean monthly tables show that the lowest altitude of the "stratosphere" was in March and the highest in August. An extraordinary increase in altitude, practically without change of temperature, occurs from April to May, viz. from 9470 to 11,050 metres; but owing to the few and unequal number of cases available, the results deduced can only be accepted with caution.

The first part of a series of valuable contributions to the

climatology of South Germany appears in the "Bavarian Meteorological Year-book" for 1909, viz. investigations by MM. E. Alt and L. Weickmann on thunderstorms and hail, from observations made in Bavaria, Württemberg, and Baden during 1893-1907 at carefully selected stations. The discussion is carried out in great detail, with tables for geographical districts, isopleths for thunderstorm frequency in W.-E. and N.-S. directions, and by charts, but we can only refer to some of the more general results. The mean daily period of thunderstorm frequency for the whole of South Germany shows that the principal maximum occurs between 2h. and 5h. p.m., 39 per cent. of storms taking place about 3h. p.m. In the annual period the storms occur most frequently between April and September, the maxima being in June and July. With regard to hailstorm frequency, 70 per cent. of the storms occur between noon and 6h. p.m., the maxima being from 3h. to 5h. p.m. In the yearly period they occur most frequently between May and July, the maximum being in June, and, compared with the number of thunderstorms, hailstorms were comparatively rare. It may be mentioned that investigations as to a possible connection of thunderstorm frequency with the sun-spot period led to no result.

The results of the meteorological and magnetical observations for 1909 at Stonyhurst College Observatory, Lancashire, have been received. The tables are, as usual, plainly arranged, and the departures from very long averages being given render the data exceedingly valuable. The weather of the year was generally mild and quiet; the temperature of June was 3.2° below the average, and July and December were very wet, each having more than 4 inches above the average rainfall. The mean of the highest daily temperatures was 52.1° , of the lowest 40.6° ; adopted yearly mean, 46.2° (0.6° below the average for the last sixty-two years). The highest reading was 75.1° (August 15), the lowest 15.1° (December 21). The total rainfall was 48.77 inches (1.84 inches above the normal). The mean disc area of sun-spots (in units of $1/5000$ th of the visible surface) appears at 3.8, and the mean daily range of magnetic declination at $13.5'$; the mean for the year was $17^{\circ} 28.5' W$. Photographic copies of noteworthy seismographs were supplied to various authorities, and would be sent to any observing station on application.

THE PROGRESS OF AGRICULTURE IN INDIA.¹

IT would be difficult to conceive a harder task than that set before the members of the staff of the Agricultural Department of India when they first set to work to improve Indian agriculture. The native methods of working were often primitive, their seeds were impure and their crops uncertain; the ryots were uneducated, poor, and without that ambition to rise that would have gone so far to lighten the work of the newcomers; but, in spite of all this, the Department has, in the space of a comparatively few years, done a vast amount of work; it has to chronicle failures as well as successes, but the successes have largely preponderated, and we can see some of the results in the various reports that have recently been issued.

The research institute for the Indian Empire is at Pusa, an estate of more than 1300 acres bounded on three sides by a loop of the little Gundak River. It is situated in the heart of a district where intensive cultivation prevails in consequence of the favourable climatic and soil conditions, which are also indicated by the density of the population—900 to 1100 per square mile. As, moreover, the district is largely controlled by a community of indigo planters, there is little fear that cultural improvements suggested by the staff should be unnoticed. The Phipps laboratory is said to be admirably suited for its purpose; it is provided with water-power and electricity, while the

¹ Report on the Progress of Agriculture in India for 1907-9. (Calcutta: Superintendent Government Printing, India.)

Report on the Introduction of Improvements into Indian Agriculture by the Work of the Agricultural Departments.

Report of the Agricultural Research Institute and College, Pusa, 1907-9.

Agricultural Statistics of India for the Years 1903-4 to 1907-8. 2 vols.

Report on the Operations of the Department of Agriculture, Madras Presidency, for the Official Year 1908-9.

Madras Agricultural Calendar, 1910.

soil of the experimental grounds can be made to grow practically all the important crops of the plains. The scientific staff comprises an agriculturist, a botanist, a chemist, two entomologists and a mycologist, with their supernumeraries and assistants.

In the botanical department Mr. Howard's work on wheat promises results of considerable importance both to India and to Great Britain. He has completed the classification of the Punjab wheats and has isolated some twenty-five pure types, the best of which will in time be available for general distribution. A survey on similar lines of the varieties grown in the Central Provinces, Bengal, Bombay, the United Provinces and Burma is in hand. This work is being followed by hybridisation to evolve new varieties possessing strength of straw, good cropping power, and resistance to rust. Some of the pure types which are being used as parents were found to be a great improvement on the mixed sorts previously grown, and we are not surprised to read that "large numbers of colonists came to see the plots and arranged for small supplies of seed for trial on their holdings." Not only is there the likelihood of an increased yield, but it appears that India can grow "strong" wheats such as are required in the English market, the common impression that Indian wheats are necessarily weak being erroneous. The economic results of a notable increase in wheat production of high quality can hardly be overestimated. An interesting physiological problem is also under investigation. It was found in 1908 that the same sample of Muzaffernaggar wheat sown at Lyallpur, Muzaffernaggar and Pusa gave rise to grain varying markedly in appearance, composition, milling and baking qualities. Mr. Shutt has observed similar variations in Canada. The cause can hardly lie in the amount of plant food in the soil, since no such variation is observed in going from plot to plot on the Broadbalk wheat field at Rothamsted; it must lie in some other of the factors constituting the general environment. Further investigations will be awaited with much interest.

Dr. Butler has continued the mycological work on the lines of previous years, very wisely concentrating attention on a few diseases, and carefully working out the life-history and general biology of the organisms involved. Of these, the chief are "red rot" in sugar-cane, the palm diseases, the wilt diseases of various crops, "white rust" and other diseases of citrus, the mulberry disease of Kashmir, and others. So successful has Dr. Butler been in combating the palm disease in the Godavari delta that he is considered on this work alone to have paid the cost of his department for many years to come! He has in preparation a book on Indian plant diseases that may be expected to help Indian planters considerably.

Dr. Leather was away on leave for part of the time, his place being taken by Mr. Annett. Work was continued on the losses of water from the soil, and the water requirements of plants, subjects that are obviously of fundamental importance in India. It was found also, in the first instance by pot experiments, and later by field trials, that certain soils benefitted notably by manuring with phosphates.

The task of controlling the insect pests falls to the lot of Mr. Maxwell-Lefroy, the Imperial entomologist, and Mr. Mason, with assistants for special work, but the staff is small for the work it has to do. The life-histories and habits of a number of injurious insects have been investigated, and also the influence of climatic changes on insect life and the problem of utilising beneficial insects. Attention has been devoted to sericulture and to lac. The second entomologist, Mr. Howlett, investigates Diptera. He has ascertained the life-histories of nearly all the mosquitoes occurring at Pusa, and has, in addition, found two species of fish capable of destroying large numbers of Anopheles larvae. The number of Diptera injurious to crops and animals is very considerable, and fully justifies the appointment of an entomologist to deal especially with them.

The improvement of the livestock and poultry of India is undertaken by the Agricultural Department under the direction of Mr. Shearer. A large and remunerative export trade in Indian cattle has recently arisen, for which the Montgomery appears especially suitable. Careful attention is therefore being devoted to this breed.

Such is a brief outline of the main lines of work at