

last rings of the prehistoric chronology and the outer rings were readily identifiable with the thirteenth and fourteenth century records of the historic sequence. Further excavations yielded more logs which confirmed the record of the key beam.

As the last rings of any given beam give the cutting date, when it shows the true outside, it is obvious that it also gives an approximate date for the erection of the building in which it was used, provided there is no evidence of re-use. Thus at Showlow it was possible to reconstruct the history of the building. The beams showed a period of reconstruction at about A.D. 1380, with periods of activity at 1204 and 1272, while re-used beams gave dates ranging from 1175 to 1356.

The manner in which the archaeological and chronological conclusions confirm and supplement one another is well illustrated in the reports of the investiga-

tions. There are, for example, three horizons which are dated respectively at A.D. 1204 (Showlow), 1290 (Pinedale), and 1375 (Showlow), and the sequence of the styles of pottery associated with each is confirmed. The chronological evidence indicates the length of time by which culture features survive in a marginal area while dying out in the centre of origin. Thus Chaco traits are shown to exist in the pottery a hundred years after the Chaco Canyon culture ceased to exist. Further, it confirms the views of those who argued on the basis of stratigraphy that lead glaze existed in the Pueblo culture before the advent of the Spaniards, as against those who maintained that it was improbable that it could have been used by the Pueblo potters in the prehistoric period. Dendrochronology shows that it was employed fully two hundred years before the arrival of the Conquistadores.

The Climate of Japan

IN the *Bulletin of the Central Meteorological Observatory of Japan*, vol. 4, No. 2, Prof. T. Okada gives a very thorough discussion of the climate of Japan. It is divided into three sections, entitled, "Climatology", "Climatology", and "Climatic Tables".

The first section opens with an interesting discussion on general lines of the main features of the climates of the different climatic zones into which the country can conveniently be divided, and outlines the main factors that are responsible for the primary characteristics of these. Each region is then discussed in greater detail. In the second section the method of arrangement is not geographical, but according to each climatic element: for example, air temperature, wind direction and speed, rainfall, and so on. The last section is entirely occupied with tables showing the seasonal variation of different elements; it is followed by a general index, and then by thirty-five plates setting out graphically the seasonal or geographical variations of the elements discussed earlier in the work. The magnitude of the work and the wealth of detail that it gives about a region where the organisation of climatological work on modern lines has naturally been undertaken at a later date than in Europe make it indispensable as a work of reference for professional meteorologists.

The climate of Japan, owing to the peculiar situation of that country, at no great distance from those parts of Asia which present the greatest contrasts between summer and winter to be found anywhere in the world, is a particularly interesting one; it provides an example of what Okada describes as "an extreme climate characteristic of a continent" in spite of its insular position. The winter is dominated by the prevalence of cold air flow from China. This flow does not take place across a sufficient width of sea for the latter to have very much tempering effect, but although the wind is often very strong, there is time

enough for the air to acquire a considerable amount of water vapour, and this tends to condense when the air ascends to pass across the land. The result is that "gloomy weather with snowfall prevails on the side facing the Japan Sea, and rain showers occur almost every day in the Ryûkyû or Loochoo Islands and northern Formosa. Therefore, on this side of Japan proper, snow lies deep on the ground and a thick veil of clouds overcasts the sky. Fine days are phenomenal." On the Pacific side, however, fine weather generally prevails at this season. In the islands to the south of Japan proper the influence of the Asiatic winter monsoon is overshadowed by that of the warm ocean, and luxuriant tropical vegetation can flourish.

During the summer, when the Asiatic area of high pressure disappears, to be replaced by relatively low pressure and a complete change of wind circulation, an inflow of air takes place, which crosses Japan mainly from between south and east; it is feeble and less constant than the winter monsoon, especially during the principal rainy season called the Bai-u, which comes in late June and early July. These winds do not give rise to the contrasts of climate on the windward and leeward sides of the islands found in winter, nor is there so much variation of temperature with latitude; the result is a generally hot and humid climate, appropriate to maritime conditions in those latitudes.

In conclusion, some reference must be made to a very noticeable feature of all except the southern sea-dominated parts, and that is the shortness of the spring and autumn seasons. In the north, snow may still be lying early in May, although June generally brings the heats of summer; autumn does not extend much beyond the month of October, for the cold winter winds are usually well developed by November.

E. V. N.

Weather Forecasting

IN his Friday evening discourse at the Royal Institution on Feb. 5, Dr. G. C. Simpson discussed weather forecasting. In 1859, Admiral FitzRoy, who was then the head of the department of the Board of Trade which had recently been established to study marine meteorology, commenced to collect weather reports by telegraph from a number of ports in the British Isles, and so a new science was created and a new term added to the English language. FitzRoy's innovation was not approved by scientific men, and on his death in 1865 forecasting ceased.

The public had, however, found the forecasts useful, and considerable pressure was brought to bear on the Meteorological Office to recommence the forecast service. A new attitude was possible owing to the introduction of the synoptic chart showing the distribution of pressure by isobars, the lines with which we are now so familiar on the published weather maps. It had been found that isobars could be classified in a number of types of which the most familiar are the cyclone and the anticyclone. This remained the basis of forecasting until the War, and it is still largely

employed. The method is entirely empirical and needs no knowledge of the physics of the atmosphere.

We now recognise that weather is produced by the bringing together of great masses of air from polar and tropical regions by the general circulation of the atmosphere. Such masses of cold and warm air do not readily mix, but overrun or undercut one another along 'fronts' which can be traced for hundreds of miles on the synoptic charts. The recognition of fronts has given the forecaster a powerful new tool for the study of what is actually taking place in the atmosphere, and has greatly improved the short period forecasts, especially those for aviation.

A synoptic chart which extends only over a single country is not of much value for forecasting; it is necessary to know the weather conditions over a much larger area. To meet this need there is very close international co-operation between the official weather services of the different countries. At certain specified times each day observations are taken at forty-five stations in the British Isles and on a number of ships on the Atlantic and telegraphed to London.

The same procedure is taking place in every other country. The meteorological office in Paris takes in these national messages from countries in western Europe, and the German meteorological service does the same for central and northern Europe, while Moscow deals with the whole of the great area of the U.S.S.R. Paris, Hamburg, and Moscow then reissue the messages they have collected from wireless stations sufficiently powerful to be heard all over Europe, according to a programme carefully drawn up by an International Committee. In this way information from more than five hundred stations in an area extending from Spitsbergen and Greenland in the north to Morocco, Algeria, and Egypt in the south, and from the middle of the Atlantic in the west to Russia and Palestine in the east is available in every meteorological office in Europe within two hours of the time at which the observations were taken. The whole programme of collecting and disseminating the observations is repeated three times a day by most countries, at 7 A.M., 1 P.M., and 6 P.M. G.M.T., and a certain number of countries add another set of observations at 1 A.M.

Unfortunately, no method has been found for expressing the success of weather forecasts by giving the percentages of failures and successes, but those who have to examine every day's weather in the light of yesterday's forecast know that there has been an appreciable increase in the accuracy of the forecasts and also in the amount of detailed information it is possible to include in them.

University and Educational Intelligence

CAMBRIDGE.—Prof. P. Debye, of the Physical Institute at Leipzig, has been appointed Scott lecturer for the year 1932.

Dr. E. B. Worthington (Balfour student) will lecture on Feb. 17, at 5 P.M., in the zoological lecture room, on the "Great Lakes of Africa".

A COURSE of eight bi-weekly lectures on the "Optical Principles of Television" will be given by Dr. W. D. Wright at the Imperial College of Science and Technology, South Kensington, London, S.W.7, on Tuesdays and Thursdays at 4 P.M., commencing on Feb. 23. Further information can be obtained from the Registrar of the College.

THE Council of the University of Melbourne has passed a resolution expressing to Mr. F. Chapman,

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Commonwealth palæontologist, on his retirement from the position of part-time lecturer in palæontology after twelve years' service, its thanks for the help which by his wide knowledge and great experience of palæontology he has rendered to the Geological Department of the University.

EDUCATION during the past ten years in Porto Rico is reviewed in a leaflet recently issued by the U.S. Office of Education, Washington. The review is of more than local interest by reason of the description it contains of a seemingly successful experiment in rural education of a vocational type. Thirteen consolidated rural schools have been established for pupils aged eleven years and upwards, for whom the education hitherto provided in the fourth and higher grades in Porto Rican schools offers but little hope of increasing their earning capacity. In these new 'second-unit' schools only half of the day is devoted to academic subjects, the other half being given up to vocational work, namely: for the boys, agriculture, animal husbandry, woodwork, house-wiring, tin-smithing, auto-mechanics, shoe-repairing, hair-cutting, clay work, and toy-making; for the girls, cooking, sewing, and hand and machine embroidery and lace-making; and for both, hand-weaving. Agriculture is a required subject for all boys and home economics for all girls. The boys raise a large variety of vegetables, which are sold or consumed in the school lunch-room, one-third of the cash value of produce sold being given to the boys who raised it. The children are encouraged to cultivate home gardens, of which there are more than 15,000. As a result of this system the quantity and quality of fresh vegetables available to the rural communities have improved and family incomes increased. The boys are taught also to plant the principal crops and to raise pigs, chickens, rabbits, pigeons, and goats. The breeds are being rapidly improved. The lessons in cooking aim at a diet based largely on Porto Rican produce, and the results are tested in the school lunch-room. It is noteworthy that this experiment, which is one of the fruits of an educational revival brought about by a survey conducted in 1925 under the direction of Dr. Paul Monroe of Teachers' College, Columbia University, was undertaken during a period of severe retrenchment in educational expenditure.

Calendar of Geographical Exploration

Feb. 16, 1623.—Arnhem Land

Jan. Carstenzsoon on an expedition in which two ships, the *Arnhem* and the *Pera*, took part, sighted the snowy mountain chain of central New Guinea. Mt. Carstenz, more than 15,000 feet in height, takes its name from him. The two ships became separated: Carstenzsoon in the *Pera* discovered and named several rivers in the York peninsula. Although the lands discovered by the *Arnhem* are not exactly known, the vessel explored the region between 9° and 13° S. in that part of the Northern Territory, Australia, now known as Arnhem Land.

Feb. 16, 1816.—The Congo Cataracts

Capt. Tuckey, with a party which included a botanist, a geologist, a naturalist, and a comparative anatomist, left England commissioned by the Government to ascend the Congo. Another party was sent to the Niger, and it was hoped that the two might eventually meet, Mungo Park's explorations having failed to clear up the question of the separate identity of the Niger and the Congo. Tuckey's party reached the first cataract of the Congo and thence attempted