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, 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

exploration by land. Disease, however, overtook the party and they returned to the ship, where Tuckey and others died. The companion expedition, which had landed on Dec. 14 at the mouth of the Rio Nunez, midway between the Gambia and Sierra Leone, met with equal disaster, disease and discord with the natives resulting in the death of most of the party.

Feb. 18, 1865.—Colonel Pelly in the Nejd

Colonel Lewis Pelly, British resident at Bushire, set out from Koweit with a small caravan, and after five waterless days in the desert reached the wells of Orma at the foot of Jabal Tueik. On March 5 he reached Riyadh. On the return journey the guide led Pelly's party by a route considerably to the north of Hofuf; all the main lines of relief were found to run north and south, and seven distinct ridges had to be crossed in the descent from the Tueik plateau to the coast. He covered some previously unexplored regions, but was unable to take as many measurements and observations as he had hoped owing to the need for haste in view of political difficulties. Pelly was the first representative of a European government to venture into the centre of the Arabian peninsula openly avowing the nature of his mission.

Feb. 20, 1844.—Between the Mississippi and the Pacific

J. C. Frémont, one of the greatest of American explorers, reached the summit of the snow-covered Sierra Nevada mountains. He had started out in 1842 to explore the route beyond the Mississippi as far as South Pass in Wyoming. He ascended the second highest peak of the Wind River mountains which now bears his name and in the following year reached the Oregon settlements. Thence he turned south and east via the Klamath lakes to north-western Nevada and the Truckee and Carson rivers, covering much previously unexplored country. After crossing the Sierra Nevada he spent the rest of the winter on the Sacramento River, and returned round the southern end of the range to the Great Salt Lake, following the old Spanish trail from Santa Fé to California. Frémont had accompanied J. N. Nicollet, the French explorer, in his survey (1835–40) of the country between the upper waters of the Missouri and Mississippi rivers. In 1841, Frémont headed an expedition to the Des Moines River and thus completed Nicollet's map. His explorations opened up a great part of the country between the Mississippi valley and the Pacific Ocean. Frémont had a varied career, afterwards becoming soldier, politician, and multi-millionaire.

Feb. 20, 1848.—Northern Arabia

G. A. Wallin, a distinguished Arabic scholar, who afterwards became a professor in the University of Helsingfors, left Muweila on the second of his famous journeys in northern Arabia, travelling disguised as a learned Arab sheik. Striking inland across the unexplored granite mountains, he reached Tebuk, an ancient village on the Syrian pilgrim route. Thence he proceeded to Teima, crossed a tongue of the Nafud, and after a month's stay at Hail accompanied a party of tribesmen to Meshed Ali and returned via Bagdad. On a previous journey Wallin had started from Cairo and travelled via Maan over the Hamad to Jauf. Thence he had crossed the Nafud, seen the isolated grey granite chains of Jabal Aja and Jabal Selma, and penetrated to Hail. Of Medina and Mecca which he also visited he left no detailed account. Although he took no instruments, his full and minutely accurate reports gave a clear picture of the regions through which he passed, many of them never before visited by a European.

Societies and Academies

LONDON

Royal Society, Feb. 4.—**J. R. Baker** and **R. M. Ranson**: Factors affecting the breeding of the field mouse (*Microtus hirtus*)—(1) Light. The shortening the daily period of exposure to light from fifteen hours to nine hours almost stops reproduction in the field mouse, *Microtus hirtus*. The female is chiefly affected.—**T. H. Bissonnette**: Modification of mammalian sexual cycles; reactions of ferrets of both sexes to electric light added after dark in November and December. Male and female ferrets were subjected to doses of electric light during the night between October and January. Full œstrus was induced in the females in 38-64 days and successful coitus in 59-70 days. In the males interstitial cells were stimulated and copulation took place in 59 days, but no mature sperms were found even after 71 days. Birds differ from mammals in that the males are more responsive to doses of light than females. It is suspected that, with both birds and mammals, light may act through modifying anterior lobe activity, or susceptibility to it.—**R. N. Salaman**: The analysis and synthesis of some diseases of the mosaic type. The problem of carriers and auto-infection in the potato. As a result of both analytical and synthetic methods it has been possible to ascribe compositions in terms of X, Y, and Z to certain definite clinical virus diseases. The reaction of a virus complex is not the mere summation of that of its two constituents, but rather a linked group the strength of which varies according to the complex and the internal environment of the plant. At times a complex may break up either in an infected or a carrier plant, and one or other element becomes recognised as such. If this takes place in a carrier plant it is known as auto-infection.—**C. C. John**: The origin of erythrocytes in herring (*Clupea harengus*). During the first five months of development, the herring is devoid of red blood. The demersal egg hatches into a tiny larva in which the heart is at first a simple two-walled tube divided into two parts by a narrow constriction in the middle. The vascular fluid is colourless and does not contain any corpuscles. From deep water the larva migrates into mid water, and later to the coast. During this period the endocardium develops into a syncitial sponge-work in which numerous large nuclei develop; these ultimately migrate to the surface of the sponge-work and bud off into the vascular fluid as mother-cells of the red-blood corpuscles. At the 35 mm. stage the larva is at first rather opaque and the blood is colourless. When metamorphosis starts, a silvery sheen appears on the dorsal surface, and the body becomes opaque and the blood commences to turn red. A similar condition occurs during the development of the eel; in teleosteans in general the blood originates from the intermediate cell mass during the early embryonic stage, but in herring the hæmocytopoietic function is confined to the endocardium until the spleen develops.

Physical Society, Dec. 4.—**C. F. B. Kemp**: Some properties of the sound emitted by airscrews. A condenser-microphone amplifier system has been employed to determine the intensities and directional properties of the first six harmonics in the sound of rotation of an airscrew operating at zero rate of advance and actuated by a silenced engine. The sound-energy associated with the frequencies considered is 18 watts, the fundamental (first harmonic) being responsible for 50 per cent of this, while the first three harmonics together contribute 90 per cent.