Galongs. This is written by Capt. Sir George Duff-Sutherland-Dunbar and is beautifully illustrated.

To mention by name even all the more interesting papers given in these Memoirs and Journals would occupy many pages; as already suggested, they give abundant evidence of a new life in our Eastern Empire. The suggestion might be offered, however, that the division of these publications into at least three sections, each with its own separate volume, would be both an economy and a convenience.

NEW FRENCH MAGNETIC CHARTS.[1]

IN France terrestrial magnetism is included in meteorology, and the actual survey upon which the present work is largely dependent was made by M. Moureaux, director of Parc St. Maur Observatory, then the central magnetic station for France. Prof. Angot, who is director of the French meteorological service, was responsible for the last magnetic charts relating to the epoch January 1, 1901. Whether fresh charts will continue to be published every ten years appears as yet to be undecided. Two methods were considered of obtaining the secular change data, necessary to derive results for January 1, 1911, from those for 1901. The first consisted in taking fresh field observations in a sufficient number of places, and some observations having this end in view were taken by M. Eblé in 1912 and 1913. These have served to some extent as a control, but the second method was that actually depended on. It consists in utilising the secular change data published by observatories in France and adjacent countries, including Potsdam, De Bilt, Valencia, Greenwich, Kew, Falmouth, Val Joyeux, Munich, Pola, Naples, Coimbra, and San Fernando. The ten-year secular changes at these stations were plotted in a map, and curves of equal secular change drawn, from which were deduced the secular changes appropriate to each station. The method is obviously more suitable for France than for the British Isles. But even in the case of France, in the absence of positive knowledge that secular change is unaffected by local disturbance, it is doubtful whether it will be universally admitted that the method is altogether satisfactory for the deduction of charts showing the local anomalies. It is obviously simpler, however, than the carrying out of observations at a large number of repeat stations.

The values deduced for the epoch January 1, 1911, for declination, inclination, horizontal and vertical force, north and west components, and total force are given for from 500 to 600 stations, arranged alphabetically under the several departments. The declination, inclination, horizontal force, and vertical force data are also embodied in four charts. Omitting a few incomplete or obviously disturbed stations, the remaining 538 were arranged according to geographical position in twenty groups or areas. Taking any one group, the mean of the observed values of, say, declination was assigned to an imaginary station, the geographical co-ordinates of which were the mean of those of the actual stations. In this way values were found, practically free from accidental irregularities, for twenty different points. It was then assumed that these twenty values could be represented by an expression, $a+b\phi+c\lambda+d\phi^2+e\phi\lambda+f\lambda^2$, where $\phi+47^\circ$ and $\lambda+2^\circ$ represent the latitude and easterly longitude of any station. The constants were determined both by least squares and by Cauchy's method, with very satisfactory results, showing that a simple quadratic expression suffices to give normal magnetic values with high accuracy for the whole of France.

Tunis, Algeria, and Morocco are treated by themselves (pp. 86–95). The available data consisted of observations taken by Moureaux at thirty-three stations in 1887, and of recent results obtained by the observers of the Carnegie Institution of Washington. The latter had observed at thirteen of Moureaux's stations, thus obtaining data for secular change which were supplemented by results from the observatories of San Fernando, Coimbra, Tortosa, Naples, and Helwan. A six-constant formula of the type already described seems to fit the observations reasonably well. Prof. Angot would like, however, to have fresh observations throughout North Africa, at a considerably larger number of stations. Declination, inclination, and horizontal force charts, representing normal values for North Africa as given by the interpolation formulæ, appear in the text, but on a reduced scale as compared with that adopted for the French charts, which show the actual anomalies. C. CHREE.

RAINFALL IN NORWAY DURING 1916.[1]

THE director of the Norwegian Meteorological Institute has, with commendable promptitude, published the twenty-first annual volume of rainfall data, viz. that dealing with last year's returns. The daily rainfall is given *in extenso* for about 200 stations, additional information regarding the nature of the precipitation, whether in the form of rain, snow, or sleet, being afforded by the international symbol affixed to the reading when the downfall was other than rain. A monthly summary shows, for each of 476 stations, the actual precipitation, the maximum daily fall, and date of occurrence, along with the number of days with more than 0·1 mm. and more than 1·0 mm. of rain respectively; the mean depth of snow is also given and the greatest depth recorded. The monthly and annual rainfall expressed as a percentage of the average is shown for sixty-four stations.

No general summary of the results appears, but there is an excellent large-scale map in two sections showing the distribution of the annual rainfall for 1916 by isohyetal lines drawn for each 200 mm. The maximum rainfall, shown by the isohyet of 3000 mm. (118 in.), appears in three small patches close to the coast, between lat. 60° and 61° N., the highest rainfall, 3127 mm. (123 in.), being at Indre Matre (height 15 m.), in lat. 60° N., long. 6° E. The smallest rainfall, about 200 mm. (8 in.), occurs in several areas of no great extent north of the Arctic Circle, the most extensive being an oval patch about eighty miles long and fifteen miles broad, situated due south of Hammerfest. The isohyets in some districts near the coast are very crowded, especially in areas contiguous to the wettest spots, where the rainfall in rather less than forty miles falls off from about 120 in. to 32 in.

As compared with the average, the rainfall of 1916 on the mean of sixty-four stations was 5 per cent. in excess, but individual stations varied from 51 per cent. above to 41 per cent. below the average. Rainfall was much above the average at most stations to the south of lat. 63°, but north of Trondhjem (lat. 63·4° N.) there was a pronounced deficit, ranging in general from 15 to 40 per cent. The only marked exceptions were at Gjesvair and Vardo, stations to the north of 70° and far to the east. In no month did the rainfall show a general excess or defect over the whole country, although March and August were dry, and January wet nearly everywhere. In February, June, and October to December there was a pronounced tendency to rainy conditions in the south, while a drought was experienced in the north of the country.

[1] "Réseau magnétique de la France et de l'Afrique du Nord (Tunisie, Algérie, Maroc) au 1er janvier 1911." By Prof. Alfred Angot. Ann. du Bureau central météorologique de 1911, tome i., pp. 59-95+4 charts.

[1] Nedbøriagttagelser i Norge, utgit av Det Norske Meteorologiske Institut. Aargang xxi., 1916.