being determined from a photograph which showed the comet with a tail. Its direction of movement is given as north-north-west.

A LITTLE-KNOWN PIONEER OF SPECTRUM ANALYSIS.—While we owe the birth of spectrum analysis to Sir Isaac Newton (1642–1727), the first use of the slit to Wollaston (1802), and the first accurate mapping of the solar spectrum to Fraunhofer (1814), the name of the young pioneer, Thomas Melville, who followed closely after Newton is nearly forgotten. Although Melville died in 1753, at the age of twenty-seven, he was the first to employ the prism in laboratory research, for he undertook the examination of various flames, introducing sal ammoniac, potash, alum, etc., into burning spirits. He was undoubtedly the first to observe the yellow soda flame and notice its definite frequence in flames and its position as regards other colours. His name is briefly mentioned in Sir Henry Roscoe's "Spectrum Analysis," and Miss Clerke's "History of Astronomy," gives him full credit for his work. It was in reading the latter book that the attention of Mr. John A. Brashear was directed to the reference to Melville. Through Mr. Carnegie and Dr. Hew Morrison, the latter being principal librarian of Edinburgh, Mr. Brashear was enabled to obtain copies of Melville's essays read before the Medical Society of Edinburgh on January 3 and February 7, 1752, on observations on light and colours, in which appears the remarkable observation of the peculiar sodium light. These papers are now reprinted in the current number of the Journal of the Royal Astronomical Society of Canada (vol. viii., No. 4, July-August), and a very good service has been done by making them available to everybody.

DISPLACEMENT OF SPECTRUM LINES AT THE SUN'S LIMB.—Messrs. J. Evershed and T. Royds describe in Kodaikanal Observatory Bulletin, No. 39, some further researches they have been carrying on with regard to displacements of the spectrum lines at the sun's limb. Two explanations have been suggested to account for these shifts, one view being that they are due to pressure and the other due to motion in the line of sight. In this paper the authors state that the pressure theory presents a much more rational explanation of the phenomenon than the motion theory, but hold that there are difficulties in accepting the former, which have not been lessened, but largely increased by further research. The authors consider that the relative shifts of different lines at the limb have no particular meaning when determined by reference to lines at the centre of the disc, for these latter have shifts peculiar to themselves; the measures they have made show that the absolute shifts of the lines at the limb referred to a terrestrial standard show no relation to pressure shifts, and, further, the absolute shifts do not increase with the wave-length. In the investigation now published they determine the limb shifts by combining measures of limb minus centre shifts, with the centre minus arc shifts, the algebraical sum representing the absolute or limb minus arc shifts. They deal with the limb shifts in relation to the intensity of the lines, the relation between limb shifts and pressure shifts, limb shifts in relation to wave-length, and the shifts of the cyanogen bands. The conclusions they arrive at are that both the so-called cyanogen bands and the iron lines show shifts which they attribute to a movement of recession from the earth. While the view that the solar gases are actually repelled by the earth receives some support from other lines of evidence, they consider an alternative hypothesis, namely, that the sun's gravitational field affects the wave-length of the light emitted in accordance with Einstein's theory of relativity.

CLIMATOLOGY.

A PAPER by Dr. J. H. Garrett (Medical Officer of Health) on "The climate and topography of Cheltenham and its near neighbourhood" is published in the Proceedings of the Cotteswold Naturalists' Field Club for 1913 (vol. xviii., part ii.). The tables for thirty-five years (1878–1912) are derived from the records contained in annual health reports, or from the summarised values issued by the Meteorological Office. The figures show, as the author points out, that as regards the mean monthly maximum and minimum temperatures, the alternations from one season to another are very gradual. For the years 1892–1912 these were, respectively:—January, 43·6°, 33·6°; July, 71·6°, 53·4°; absolute maximum, 93° in September, 1911, minimum 6·5° in February, 1895. The annual rainfall shows considerable variation: 19·5 in. in 1892, 37·9 in. in 1882, normal for thirty-five years, 26·8 in. The prevalent wind directions are S.-W., those from N.-E. are comparatively few, while calms are very frequent. The average yearly sunshine (1903–12) was 1553 hours. Dr. Garrett remarks that quite a different climate is experienced on the Cotteswold Hills, within four miles of the centre of the town.

An elaborate discussion by Dr. V. Conrad of the climate of Carinthia, being part vi. of the valuable climatology of Austria, has been published by the Central Meteorological Institute of Vienna. This mountainous province covers an area of 10,327 km², of which 53·7 per cent. is above the level of 1000 metres. Like other Alpine countries it partakes of the sea climate of western Europe and of the land climate of eastern Europe, and is subject to abrupt contrasts within short distances. Tröpolach, for instance, in the Gail Valley, with an eastern aspect, has a mean January temperature of 18·7° F. and a winter temperature of 22·3°, while Pontafel, 7½ miles S.S.W., with a south exposure, has a January temperature of 28·6° and a winter temperature of 30·6°. The mean absolute yearly range of temperature in some of the valleys amounts to above 50° C. (90° F.); the absolute extremes recorded were below −22° F. and above 95° F. The yearly distribution of rainfall is well shown by a tinted map, referring to the period 1876–1900. With few exceptions there is a tendency towards increase of rainfall from north to south. The driest parts are the Noric Alps and neighbouring districts, with 31–35 inches of rain; the wettest parts are in the south-west, with 58–78 inches. The province possesses several long series of observations, *e.g.*, for Klagenfurt since 1813, but there is only one sunshine recorder, which is at the latter station.

Dr. Filippo Eredia has recently contributed to the *Rendiconti* of the Accademia dei Lincei (vol. xxiii.) two interesting memoirs on the distribution of cloud in Italy. The papers show the seasonal and annual distribution for 132 cities, and the orographic influence on the monthly mean values at a number of stations in the valley of the Po. In the latter region, on the Adriatic, central and lower Tyrrhenian, and Ionian slopes, winter is the season of most cloud. On the upper Tyrrhenian slope and on those near the Alps, spring is the cloudiest season. At Alpine regions and those under the direct influence of mountain systems there is generally least cloud in winter and in summer at other stations. The mean annual distribution and amplitude are shown by diagrams.

Another paper by Dr. Eredia, on the climate of Southern Italian Somaliland, is published by the Colonial Ministry of Rome as No. 14 of *Rapporti e Monografie coloniali*. The observations include *inter alia* those made by the Italian expeditions and at stations afterwards established, and are carefully

discussed under six separate elements. The climatological conditions are dominated by the N.E. monsoon (December–March) and the S.W. monsoon (June–September). The author points out that the temperature is very regular, there being only a difference of a few degrees between the means of the hottest and coldest months. The absolute maximum and minimum quoted during 1910–12 at six selected stations are 98·6° (in April) and 59° (in August), both recorded at Brava. The rainfall reaches its maximum values in April and November; the first rainy period is followed by falls of decreasing intensity and frequency in the coastal districts, and the second period by very scanty falls in the interior and extreme dryness on the coast. The largest yearly mean quoted is 30·1 in. (on fifty-two days) at Balad, and the smallest, 10·6 in. (on thirty-three days) at Giumbo. Generally speaking, rain falls in eight months on the coast and ten months in the inland districts.

The Bulletin of the Italian Royal Geographical Society for August contains a useful contribution to the climatology of Ethiopia by Dr. Eredia and Dr. De Castro. The results are chiefly based on observations made partly at Addis-Abeba and partly at Addis-Alem, from November, 1901, to June, 1911, excepting between July, 1904, and April, 1905, with instruments supplied by the Italian Meteorological Office. Monthly results for each year are given for temperature and rainfall, and in a less complete way for humidity and wind-direction. The mean annual temperature is 62·1°; highest mean monthly maximum, 80·1 (May); lowest mean minimum, 42·8° (December); absolute maximum, 100·4° (September); absolute minimum, 32·0° (December). The annual rainfall is 47·7 in., on 148 days. The authors' division and description of the seasons give a good general idea of the climate: winter (October–December), low temperature and scarcity of rain; spring (January and February), moderate temperature and relatively small rainfall; summer (March–June), high temperature and relatively large rainfall; autumn (July–September), moderate temperature and abundance of rain. The division of the year into seasons by the natives is essentially based on the occurrence of rainfall periods.

An article by Prof. Karl Dove, on the climate of German South-west Africa, was contributed to *Himmel und Erde* of December, 19, 1913. The protectorate extends from 17° to 29° S. latitude, but its position on the west side of the continent greatly modifies its climatological features, as compared with those on the eastern shore. Near the coast the cold water of the Benguella drift-current reduces the temperature considerably; but the inland parts owe their relatively low temperature to their great elevation above the sea. The annual range is very regular, and the approach of summer or winter has little interest for the inhabitants compared with the date, duration, and amount of rainfall. The heavier falls mostly occur between January and March; irrespective of small variations, Prof. Dove states that, with the exception of the extreme south, six- to seven-tenths of the year's rainfall may be referred to those three months. In large tracts of the western zone the annual fall does not exceed eight inches, and in some years little or no rain falls, not only in the coastal districts, but also in the interior of the country.

A very interesting and useful work on the climate, typhoons, and earthquakes of Formosa, with tables and diagrams, has recently been issued by the Government-General of that island. The meteorological service was organised in 1906 under an Imperial Japanese ordinance; observations are made at ordinary stations, lighthouses and rainfall stations, and the work is carried on almost entirely at Government expense. The central observatory at Taihoku receives and discusses all observations and also receives a number of telegrams and issues weather forecasts and storm-warnings for the whole island. The climate is subtropical, and may be divided into two seasons; the seven months April to October may be regarded as summer, and the five months November to March as winter. Throughout the island the mean monthly temperature rises to 68° F. in April; from June to September it ranges between 79° and 82°. The highest readings reach about 95°, and in rare cases exceed 98°. In winter the variations between the north and south of the island become more apparent; in February, the coolest month, the mean is about 58° in the north, and 68° in the south. The lowest readings in the north do not usually fall below 41°, and in the south not below 49·6°. In winter the N.E. monsoon brings rain to the northern parts, and in summer the S.W. monsoon and thunderstorms bring abundant rain to the south; the island, therefore, possesses two rainy seasons, each differing in time and place. Formosa lies in the highway of typhoons, and is often visited by those destructive storms; during seventeen years (1897–1913) thirty remarkable storms occurred during the months June to October. Earthquakes are also frequent; all the ordinary observing stations are supplied with seismographs, and shocks are recorded somewhere in the island about every day and a half. The most violent earthquakes are generally in the south-west, and occasionally cause disastrous damage.

ORNITHOLOGICAL NOTES.

THE eighth volume, comprising 533 pages of text, of the *Boletin do Museu Goeldi* (*Museu Paraense*) is devoted to a catalogue of the birds of Amazonia—Catalogo das Aves Amazonicas—by Dr. E. Snethlage. The author, who joined the staff of the museum at Para in 1905, commenced work on this catalogue very soon after his arrival, and devoted to it a large portion of his time during the following half-dozen years. Fortunately, the collection of bird-skins in the museum—some 10,000 in number—is sufficiently comprehensive to have enabled him to accomplish his task on a thoroughly scientific and first-hand basis. The result is a work which forms a worthy companion to Dr. Ridgway's "Birds of North and Middle America," albeit in an absolutely and relatively smaller compass. The author is, indeed, to be congratulated on the conciseness of the generic and specific diagnosis and the clearness of the "keys."

In connection with the above may be noticed the concluding portion of Mr. R. Dabbene's distributional list of Argentine birds, which appears in No. 6 of the first volume of the *Boletin de la Sociedad Physis*, Buenos Aires. The author recognises a total of 324 species. In Dr. Snethlage's catalogue the species are not numbered.

In an editorial article in the August issue of *Wild Life* it is stated that the Paris Committee of Economic Ornithology has been discussing a scheme for breeding white egrets in the marshes of Corsica, and also for rearing these and other birds with valuable plumage in Tunis. In the latter country the idea is that the Government should offer stock-birds on easy terms to the colonists, such birds to remain Government property, but the resulting offspring to belong to the breeders. The same issue contains two beautifully illustrated articles on Spanish heronries, where white egrets, night-herons, and other allied species breed in large colonies.

The July number of *The Emu* contains coloured illustrations of two species of parrots from Northern Queensland, severally representing genera unknown