

cent of copper. The deposits of lead so far discovered are few, but its presence has been determined in Rio Grande do Sul, Sao Paulo, and Minas Geraes, generally in connection with silver—argentiferous galena—and sometimes with gold. Bismuth and antimony are found in combination with ores of other metals, but not as yet in considerable quantities.

Up to the present, the deposits of coal discovered are not, relatively, so extensive as those of iron, but its presence has been determined in Sao Paulo where the borings indicated its existence in quantities and situations that render probable a profitable extraction. In Santa Caterina, in the valley of the Tubarao, bituminous coal exists, and a concession has been granted by the Government for working the beds. The State of Rio Grande do Sul appears to be the most favored in respect to coal deposits. In the Candiota basin, veins of coal crop out, of a thickness varying from four to six feet, but the only mines worked up to the present are those of Arroio dos Ratos, which supply coal to the steamers that ply on the river and to the Government railway.

Marbles are abundant and widely distributed; they are of various colors, and resist the disintegrating influences of the climate, under conditions destructive of the marble imported from Europe. In Rio Grande do Sul and Sao Paulo are various manufactures of works of marble. Important deposits of loadstone are found in Minas Geraes. In the State of Goyaz, in the Sierra dos Cristaes (Crystal Range) are found in abundance the well-known "Brazilian pebbles," whose pure quartz is employed in the manufacture of lenses and spectacles. They are found near the surface, usually covered with a coating of iron oxide. In the calcareous caverns of the San Francisco plateau and of the river Velhas, in Minas Geraes, saltpetre has for a long time been collected. One of these grottoes, near Diamantina, furnished within a few days after its discovery forty tons of the pure crystals. Graphite is also found in considerable quantities in Minas Geraes, one of the deposits yielding 83 per cent of carbon suitable for pencils.

THE CLIMATOLOGY OF BRAZIL.

A PAMPHLET by Sr. H. Morize, entitled "Esboço de uma Climatologia do Brazil," has been issued from the Observatory of Rio Janeiro. The author divides the country into three great zones—tropical, subtropical, and temperate. The first, in which the mean temperature exceeds 77° F., embraces the northern part of Brazil, and is bounded to the south by a line running along the south side of the State of Pernambuco, across Goyaz, and somewhat to the south of Cuyabá. The second lies between the isothermals of 77° and 68°, and extends into S. Paulo and Paraná, leaving a portion of these provinces, with Sta. Catharina and Rio Grande do Sul, to form the third zone, in which the mean temperature oscillates between 68° and 59°.

The tropical zone may be again divided into three regions, the Upper Amazons, Matto Grosso and the interior of the states on the Atlantic border, and the Littoral. On the Upper Amazons there are two rainy seasons, the principal one lasting from the end of February to June, and the other from the middle of October to the beginning of January. During the intervening dry season the rivers fall sometimes as much as 46 feet. Sr. J. Pinkas found that the mean temperature was 79°, but the maximum was 103°, which is comparatively low. The heat, however, was very oppressive, owing to the excessive moisture in the air. The prevailing wind blows

from the south-west, and is frequently interrupted by calms. Towards the end of the great rains the phenomenon known as *friagem* occurs, which is a sudden fall of temperature produced by an influx of cold air from the Andes. It can only take place on a calm day, and is preceded by a high temperature, an almost complete saturation of the air, and a barometric fall of about .2 inches.

In the second subdivision heavy rains occur in spring and summer, and the thermometer often rises as much as 35° in a few hours. These sudden changes are produced by the rapid alternations of north-west and south-east winds, the former warm and moist, the latter always very cold. Dr. Morsback gives the mean temperature as 79.25° F. The average rain-fall is 45.9 inches, and the number of raining days 85. In this region also there is a period of *friagem*.

The third subdivision is characterized by rains in summer and autumn, and particularly during the month of April. The differences of temperature are much less than in the other subdivisions, 84° F. having been recorded at Vizeu in Pará during December, the warmest month, and 80° F. at the same hour, 9 A.M., during July, the coolest month. The mean rain-fall is about 58 inches. In the dry season the prairies are withered and scorched by the heat, and the cattle that feed on them suffer terribly. Occasionally the rains do not make their appearance at all, and then famine spreads throughout the country. This calamity has occurred six times already during the present century.

The subtropical zone closely resembles the warm regions of the south of Europe. Both the temperature and the rain-fall vary considerably according to the situation. The climate of the third zone is one of the finest in the world, and therefore the States comprised in it have been almost exclusively chosen by European immigrants. The rainy season does not occur in the same months as in the other regions: rain falls chiefly in the winter and autumn. As the distance from the equator increases, the transition between the wet and dry seasons becomes less distinct. The meteorology of Sao Paulo and Rio Grande do Sul has already been noticed in the *Scottish Meteorological Journal* (vol vi., p. 332, and vol. vii., 536). Sr. Morize's paper is very useful for those who wish to study the subject minutely, for he has collected numerous records of observations from all parts of the country.

YEZO.

THE island of Yezo, or Hokkaido, has an area of about 30,500 square miles. Its population, said to have been 27,000 in 1869, was, in 1889, 254,805 (including the Kurile Islands), according to the Japanese census reports. The Government, according to the *Scottish Geographical Magazine*, is actively developing the country. It is constructing a net-work of roads by convict labor, and intends to form a new capital near the source of the river Ishikari. The plan provides for 17,472 colonists, besides 1,920 houses for Tonden-he. These latter are military colonists, each of whom receives a grant of about 8 acres of land and a house, on condition of serving in war up to the age of 40. Another town is to be founded on the Sarachi. A railway from Sapporo to Mororan has been proposed, the harbor at this place being more convenient than that of Orunai, where the coal of Yezo is now shipped. The dwellings of the inhabitants are by no means adapted to the rigor of the climate: those of the military colonists are slightly superior, and consist of two apartments. Cultivation and fishing are the chief occupations. Vegetables, millet, potatoes, wheat, barley, rice, and beet-root are culti-