tures. The results indicate that in the case of mean annual maximum temperatures continentality has a greater effect than latitude, whereas in the case of mean annual minimum temperatures, latitude is of equal importance with continentality.—*N. H. B.* 551.46(27)

Some remarkable features of the Gulf Stream, by P. Idrac (Comptes Rendus des seances de l'Academie des Sciences, Tome 188, No. 9, p. 644).—These studies were made this winter (1928–9) in the Florida Strait during the course of oceanographic researches assigned to me by Monsieur Claude in view of the installation on the coasts of Cuba of the first Claude-Boucherot works utilizing the thermal energy of the sea.

As is well known, the Gulf Stream is a warm current which, after being formed in the Gulf of Mexico, escapes toward the Atlantic Ocean through the passage about 70 miles wide and 1,000 to 1,800 meters deep separating Cuba from the reefs west of the point of Florida.

For four different dates in a period of three months I was able to construct thermal cross sections of the strait, each obtained from some 50 measurements to a depth of 1,000 meters well distributed over the whole extent of the strait, each of these measurements being checked by the simultaneous reading of two upsetting thermometers.

Some simultaneous measurements of the current were made from the surface to a depth of 1,400 meters by means of the recording apparatus for velocity and direction described in an earlier paper (Courants sousmarins de Gibraltar, Comptes Rendus, 186, 1928, p. 1058). The drift of the boat was reckoned from bearings of the land. The effect of the wind and the swell was eliminated by plunging the apparatus some meters below the surface, which gave the proper drift of the boat relative to the surface current. The apparatus was then lowered to different depths to obtain the velocity of the deep current relative to the drift of the boat, whence there could be deduced by a simple graph the actual velocity of the deep current.

Better than all explanations the figures give an idea of the structure of the Gulf Stream and of the rapid thermal variations which can in certain cases amount to more than 5° C. in five days.

Fortunately for the project of Monsieur Claude all of this variability fades out much below the depth of 800 meters, which appears scarcely touched by the Gulf Stream except when it is very strong. At 1,000 meters, for example, there is almost uniformly a temperature of 5° C. in the entire length of the channel.

The bulk of the current is generally nearer to the coast of Cuba than to the Florida Keys. It approaches or recedes, it seems, in a rather irregular manner, but in a manner that is without doubt connected with the extent of the cold current from Labrador, which extends, as is seen in the figures, along the coast of Florida, where it gives, at equal depth, lower temperatures than those on the Cuban coast.

At the surface the axis of the current of the Gulf Stream generally coincides roughly with the axis of the highest temperatures (yet when the Gulf Stream recedes from the Cuban coast the surface in that vicinity remains warm). Each time that we were able to make measurements we found that in the depths the axis of the current did not coincide with the vertical axis of the surface current and was plainly shifted toward the Cuban coast.

Where it is strongest (having a velocity of 3 knots in the period of our measurements) the current remains rather constant from the surface to a depth of 300 meters and then gradually weakens. Sometimes there are still found currents of 1 knot at the depth of 500 meters and of 0.5 knot at the depth of 1,000 meters.

From the results obtained there can be deduced the approximate discharge of the Gulf Stream. This, too, is very variable; for example, it was of the order of 50 cubic kilometers per hour on December 1, 1928, but amounted to about 90 cubic kilometers per hour on January 31, 1929.

Without doubt it would be interesting in the general study of the currents of the Atlantic Ocean and, perhaps, even of the climatic variations of western Europe to make periodic measurements of the discharge of this mighty river of warm water.

The first four figures (not reproduced) represent the thermal cross sections, on different dates, of the Strait of Florida between Havana and the Florida Keys. There will be noted, among other things, the rapidity of variation between November 26 and December 1, 1928.

The last figure shows the form of the current of the Gulf Stream off Havana. The heavier the shading, the stronger the current. The prolongation of the beds of the deep current toward Havana appears to be due to the influence of the cold current coming from Labrador and skirting the coast of Florida in the depths.—*Translated by W. W. Reed.*

Early meteorological observations in northern Michigan.—We are indebted to Nathan C. Rockwood, editor-manager of Rock Products of Chicago, Ill., for nine months meteorological observations made at Michilimackinac, Mich. (present Mackinac), by Captain Dunham from August, 1802, to April 1803, both inclusive. The observations came into Mr. Rockwood's possession through his great-grandfather William Dandridge Peck, professor of natural history at Harvard and an early American scientist. The observations were made three times daily at sunrise, noon, and sunset. The mean temperature has been computed by taking one-third of the sum of the means for the times mentioned, the resulting means being quite close to those that would be obtained from the daily extremes.

The temperatures recorded by Captain Dunham do not differ greatly from those made at Cheboygan, Mich., a short distance from Mackinac, in more recent times—the summary as prepared by the Climatological Division of the Weather Bureau follows.—*A. J. H.*