

The phenomenon was observed for about thirty minutes, when it was blotted out by heavy, dark clouds from the south-west. Within a short time the sky was darkly overcast and rain began to fall, lightly at first, accompanied by slight fog; later rain fell very heavily, the rain gauge giving a total of 1.97 inches for the afternoon.

The mirage was seen by practically all the residents at the station.

The meteorological conditions do not point to anything extraordinary. The synoptic chart for 7 A.M. shows an anticyclone centred westward of the mouth of the English Channel, with a very slight ridge of high pressure extending over Ireland and up the West Coast of Scotland. The temperatures at 7 A.M. were 48° at Wick and Stornoway, 51° at Castlebay, and 55° at Aberdeen. There was therefore a fairly sharp discontinuity of temperature along a line just south of Cape Wrath. The wind at 7 A.M. at Cape Wrath was from west by north. By 1 P.M. a secondary depression had advanced from the Atlantic, and was centred about 50 miles north of Stornoway, giving a south-westerly trend of isobars over the coast line from Cape Wrath to Dunnet Head. The temperature at Stornoway was now 52°, but only 47° at Wick, where the wind was still light.

The mirage was seen at 10.30 A.M., at the time when the wind was backing in front of the depression. The Deerness anemograph shows a slight backing of the wind from west by north at 10.30, and a further slight backing to west by south about 11 A.M. The wind blew steadily from west by south until 3.30 P.M., when it shifted to north in the rear of the secondary.

It will be noted that the phenomenon occurred at a time when the warmer current in front of the secondary depression had not completely displaced the colder air from the immediate vicinity of the coast line. There would remain a cold pocket of air under the cliffs, and other masses of cold air would probably be trapped by the hills near the coast.

The only suggestion which I can offer as a basis of explanation for the phenomenon is that there was a sharp surface of discontinuity—approximately vertical—between the warm air over the sea and the cold air under the cliffs, and that some distance inland there was another nearly vertical surface of discontinuity between the cold air near the coast and warm air which had penetrated inland through a gap in the hills south of Cape Wrath.

Reflection of light at two such surfaces of discontinuity would account for the phenomenon, the effect being that produced by two mirrors, one in front, and one behind, the observer. There should be a small amount of reflection at any sharp surface of discontinuity, perhaps sufficient to account for the phenomenon being visible through a telescope. The extremely small limit of the region from which the phenomenon was visible would place the inland discontinuity near to the observer. The effective surface of the mirror may have been quite small.

Mr. Anderson records that there was a slight fog when the rain came. The fog would be produced by the mixing of the warm humid current with the colder air which had previously remained over the coast.

The phenomenon has been called a mirage, but the mirage as ordinarily understood is either an effect of refraction in air stratified horizontally, or, in the case of inverted mirage, is an effect of reflection at a horizontal surface at which there is a rapid change

of density. But the admitted theory of formation of inverted images confirms the claim that there should be reflection at a surface of discontinuity of density. The phenomenon described above might perhaps be named a "vertical-reflection mirage," to distinguish it from the ordinary mirage due to refraction or reflection in air stratified horizontally.

No other records of similar phenomena can be traced, probably on account of the fact that such mirages are never likely to be visible to the naked eye. The telescope is useful in such cases only in so far as it limits the amount of light reaching the observer's eye. A plain tube without lenses would probably have shown the mirage more clearly than a telescope.

Mr. Anderson has been keeping a watch for others, but so far without success. This particular observation has been perhaps due in part to a series of happy accidents, in that the observer happened to be in the best position to note the effect, at the time when a wandering sheep roused his curiosity. Much credit is due to him for the trouble he has taken to draw the map and sketch, and to write a very detailed account of what he saw.

D. BRUNT.

Meteorological Office, Air Ministry,
January 26.

The Sugar-Cane Mealy-Bug.

I HAVE just received a very interesting paper on the sugar-cane mealy-bug (*Pseudococcus sacchari* Ckll.) from Mr. W. J. Hall, of the Ministry of Agriculture, Egypt. He describes the insect as being so injurious that "the whole future of the industry hangs in the balance." When I was recently in Madeira I examined the sugar-canes wherever I went, and found only a sparing and local infestation by *P. sacchari*. I had no microscope with me, but the determination was confirmed by Mr. E. E. Green. The insects may be found on the canes near the cliffs below the new road, a short distance west of Funchal. It is certainly worth while to determine why the pest is so serious in Egypt, and scarcely noticeable in Madeira. It may be that there is more damage in Madeira than I thought, but probably some efficient parasite will be found there. By collecting a quantity of the white material and placing it in a box, the parasites might be bred. That there is a parasite we know for certain, as my first sending from Funchal to Mr. Green could not be positively determined, consisting only of a mass of waxy secretion with fragments of the coccid, along with larvæ and pupæ of a parasitic Dipteron.

It is worth while to record at this time the occurrence of a really dangerous pest in Madeira, the *Aleurothrixus howardi* (Quaintance), on citrus in Dr. Grabham's garden in Funchal. It was determined for me by Dr. A. C. Baker of the U.S. Department of Agriculture. The infestation, while local, was very heavy, and if the insect spreads it may become a serious menace to the cultivation of oranges and related fruits.

Another potential pest found in Madeira is the rose-weevil *Pantomorus fulleri* (Horn). A single specimen was given to me by Mr. A. C. de Noronha, who found it in the vicinity of Funchal. It was identified by Dr. G. A. K. Marshall. As no other specimens have been found, it has perhaps not succeeded in getting established.

T. D. A. COCKERELL.

University of Colorado,
January 2.