

from below they appear black, whereas if you look at them from above they still remain honey-coloured. The accompanying diagram (Fig. 2) shows to demonstration that this can only be the case if the cones lie on an inclined plane with the apices a little above the plane which divides the cornea horizontally into two equal halves.

Thus the simple mechanism by means of which the change of colour is controlled by the spider (in at least six species of spiders, and most likely in many others) has been satisfactorily explained.

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### Meteorology of the Indian Ocean.

THE immortal Bacon laid it down as an axiom that the scientific man loveth truth more than his theory. Let this serve me as an apology for trespassing on your space. In NATURE of September 17 there appeared an interesting review of a work by the Netherlands Meteorological Institute, dealing with the meteorology of the Indian Ocean, which appears to me deserving of comment. Your reviewer says that the data therein are made available "for the sailor and the meteorologist." Permit me to suggest that this statement is unfair to the sailor. Every shipmaster is perforce a meteorologist, but every meteorologist is not a shipmaster. Much, however, depends upon what is meant by the ink-horn term "meteorologist," and it is necessary to define our terms before proceeding to argument.

The reviewer credits the Netherlands authorities with having omitted from their charts "unnecessary details or results of doubtful utility," including fog. I would submit that information with respect to fog probability is both necessary and useful for seafarers. Some shipmasters might stoutly assert that such information is to be preferred before average isobars. Rain gauges are not usually carried on board ship, and to calculate humidity from the large majority of the wet- and dry-bulb observations taken at sea would be but to court confusion. The readings of rain gauges and of wet bulbs on board ships under way are often destitute of scientific value by reason of the environment. Hence, in my opinion, the Netherlands charts gain in quality by the decrease of quantity under those heads.

The reviewer emphasises the contention that the average sea-surface current, in regions where the wind is fairly constant in direction, flows to the left of the average direction of the surface wind in the southern hemisphere. Surely such deviation is merely apparent! Current charts of the several nations differ *inter se*. Perhaps too much has been made of the effect of the earth's rotation on the direction of the surface wind, and your reviewer pushes the theory off the solid ground of nature. With one dip of ink the meteorologist dwells on cyclonic indraught and anticyclonic outdraught as though the earth were at rest, and with the next dip he fixes our attention solely on the rotation of the earth, to the utter exclusion of indraught and outdraught. One thing is certain. Had the reviewer helped to make ocean currents by faulty steering, or dealt with the current data in ships' log-books, it is probable that he would be chary of making any hasty generalisation even though it appear to agree with Nansen's drift or Ekman's theory. I seem to remember that serious objections to the geographical positions of the former remain uncontroverted.

Many of the so-called currents used in the compilation of the Netherlands charts are open to re-consideration. On p. 11, for example, the components of three alleged currents are +5 and -6, with a resultant of 2.6 miles in twenty-four hours. Either the currents were insignificant or they were contradictory. Had every difference between a ship's position by observation and by dead reckoning, which gave a resultant of five miles or less, been regarded by the compilers as "no current," as is usual in this country, a large proportion of the Netherlands current resultants must have suffered modification. Errors in steering, variation, deviation, leeway, distance run, and other items which are known to the sailor, are all dumped into the dead reckoning position, and even the position by observation of a heavenly body is not free from imper-

fection. Moreover, the seaman has a way of his own in keeping a log-book, and unless the log-books used by the Netherlands authorities were first carefully examined by the nautical experts, the results obtained are probably misleading. The sea is full of secrets, and, as Longfellow sang, "only those who brave its dangers, comprehend its mystery."

The reviewer says that in the pressure charts not only the average isobars are drawn, but also the average pressure for each two-degree area is inserted; but I fail to follow his explanation of the latter innovation. Small departures from the normal barometer values in the tropics may be, as he suggests, monitors of an approaching cyclonic disturbance, but, depend upon it, the seaman pays far more attention to the action of his barometer, as regards interference with diurnal range, for example, at the instant. Granting your reviewer's argument to be sound, there does not appear to be any logical connection between it and the erratic differences of the individual means on the charts from the isobars. The Netherlands observations, as is evident from previous publications, are on zones which join the Cape with Sunda Strait and Perim with Aceh Head. Elsewhere the results are on an unsatisfactory foundation. In one two-degree area, for example, there may be a discontinuous series of six observations, in 1856, 1886, 1887, 1897, 1903, and 1904, respectively, nearly all of gale force; and in the adjacent rectangle six times as many observations, all in one year, from a single ship detained by light winds and calms. This explains the fallacy involved in the reviewer's inference.

Dr. Shaw, F.R.S., in his address at the British Association gathering in Dublin, pathetically referred to the ever rising tide of meteorological literature, and many are overwhelmed by it. Byron has well said that "a man must serve his time to every trade, save censure, critics all are ready made," but the above remarks are written to elicit the truth, and a long apprenticeship has been served by me in marine meteorology.

WM. ALLINGHAM.

"Saratoga," Clairview Road, Streatham, October 3.

MR. ALLINGHAM submits that information with respect to fog probability is both useful and necessary to the seafarer. I do not deny the usefulness; what I implied was that in the present state of meteorology no adequate information of fog probability could have been conveyed to sailors by making charts of fog from the observations for the region under consideration. The charts showed the northern limit of the region in which the sailor might expect fogs, and this was stated in my article.

I was aware of the fact that rain gauges were not usually carried on board ship, and that observations of the wet-bulb were not always made with the carefulness and precision necessary for humidity calculations. It was to stimulate interest in these important meteorological elements that I remarked on their absence from an important publication. It is not impossible to obtain really useful results for rainfall and humidity by observations made at sea.

With regard to the ocean currents, I was directing attention to a point worthy of further investigation. I did not push the theory anywhere. I commented on the fact, obvious on a comparison of the charts, that the wind and current were related in the way indicated by Ekman's theory.

It is useless for Mr. Allingham to attempt, by directing attention to the large and well-known possible errors of a single observation, to abolish the cumulative evidence of a long series of observations over a large part of the ocean surface. I made no hasty generalisation. The deviation of the current in the Indian Ocean to the left of the S.E. trade wind and of the W. to W.N.W. wind of higher southern latitudes is a real deviation.

The insertion of the mean value of the barometer reading was not intended to supplant the sailor's knowledge of the effect of diurnal variation or any other effect that would enable him to make a good forecast, but to supplement it. Its value is not destroyed by the existence of errors in some of the mean values.

E. GOLD.