

the final increase above normal density after 209 hours was only $+0.00004$. The actual change in density between the first and last reading was, however, approximately the same, namely, $+0.00032$ and $+0.00044$ respectively.

Further work on this subject with other liquids in contact with a variety of surfaces is being actively undertaken and will form the subject matter of a detailed communication to be published elsewhere; meanwhile it seemed to be desirable that these results, substantiating as they do those of Baker, should be briefly indicated.

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Water-spouts and Tornadoes.

WHEN at Frinton recently I was interested to notice a series of whirls like water spouts on a small scale forming on the beach. The smooth, sandy beach at Frinton is protected by a series of low wooden groynes consisting of planks supported at intervals by posts some nine inches square driven into the sand. The planks rise to about a foot above the sand and the posts project somewhat more, as shown in the sketch (Fig. 1). The wind

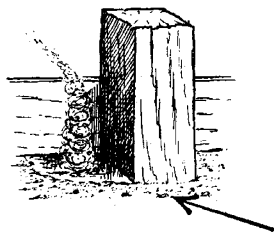


FIG. 1.

was blowing up the beach slantwise to the groynes in the direction of the arrow, and in the corner between each post and groyne a perfect little tornado or water-spout was formed. The breaking waves were throwing up foam which was trapped in the shallow pools behind the posts, and this foam was whirled round and lifted into the air by the eddy, the foam thrown by each successive wave being quickly carried away over the groyne. Thus far the phenomena described scarcely call for comment, as the wind blowing round the post would, naturally, cause an eddy in the corner, but the remarkable fact was that the eddies were of such violence that not only foam but drops of water were lifted and, at times, a raised cone of water was visible in the centre which appeared to be at least $\frac{1}{4}$ -inch high. Where did the suction come from?

An outstanding problem connected with water-spouts and tornadoes is the means by which the suction is maintained at the top. The centrifugal force will prevent inflow at the sides, but the whirl cannot be endless, and it has always been a matter for conjecture why air does not flow in from the end and destroy the eddy. Mr. F. J. W. Whipple some years ago suggested that cloud pendants, a similar type of phenomenon, might always occur in pairs, each pair being joined above the clouds and forming a single vortex both ends of which rested on the ground. There seems some difficulty in accepting this view, and the miniature water-spouts at Frinton were certainly each self-contained. It is very difficult to see what force at the top balanced the suction, which was clearly shown at the bottom by the raised cone of water. The wind was of Beaufort force 4 or

perhaps 5; it can scarcely have exceeded 15 miles per hour just above the surface of the sand. If this wind passed over an orifice of the most favourable shape it could not produce a suction equal to $\frac{1}{4}$ -inch of water. The matter might repay further study at Frinton or elsewhere.

Mr. W. Hayes, of the Meteorological Office, has kindly made from my description of the occurrence the sketch which illustrates this letter.

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Early Experiments on Ultra-Filtration.

A PAPER by Wilibald Schmidt, entitled "Experiments on the Velocity of Filtration of Different Liquids through Animal Membranes" (*Ann. der Phys. u. Chem.*, **99**, p. 337; 1856), records an observation which appears to have escaped the historians of colloid chemistry.

The author states that the concentration of the filtrate was compared with that of the original liquid and was found to agree with it when the solutions filtered contained sugar or salts. He then continues: "A different behaviour was shown by solutions of gum arabic and of white of egg, which gave perceptibly less concentrated filtrates, although the solutions had previously been filtered; the former repeatedly through linen, the latter through paper."

This demonstration that an animal membrane is much less permeable to colloids than to sugar or salts antedates Thomas Graham's papers on dialysis by five or six years. Schmidt's procedure, however, is really what is now called ultra-filtration, namely, the separation of colloid particles from the dispersion medium by means of a suitable septum, generally a gel (C. J. Martin, 1896).

Schmidt did not follow up his observation, but confined himself to studying the rate of filtration of true solutions with the view of testing whether it agreed with Poiseuille's law.

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The Sources of Supply of Vitamins A and D.

MESSRS. Rosenheim and Webster, in their very interesting letter to NATURE of Sept. 24, have suggested that it should be possible to make margarine into "a perfect biological substitute for butter" by incorporation of a suitable content of the vitamins A and D. It would appear from this communication and from other recently published statements that it is not generally known that this problem has actually been solved, and that to-day it is possible to purchase margarine containing regular and uniform quantities of both vitamins of the same order as the quantities found in butter.

Researches carried out in our laboratories have led to the development of a large-scale method of obtaining from cod-liver oil a palatable extract containing in highly concentrated form the vitamins A and D, and it has been found possible to incorporate this concentrate in margarine without loss of vitamin efficiency. The potency of the concentrate has been established by colorimetric and biological tests, and extensive feeding trials have shown the vitamin margarine to be equal to butter in its power to promote calcification and restore growth in rats fed on a deficient diet. We shall be glad to send samples of these products to any scientific worker who may be interested in the subject.

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