Surface Motion of Water Induced by Wind: Dr. Irving Langmuir

The American Association for the Advancement of Science:

Some Unsolved Problems in Human Adjustment: Professor A. T. Poffenberger

Obituary:

John Kunkel Small: Dr. J. H. Barnhart. Leo D. Whitney: Professor B. A. Madson. Recent Deaths

Scientific Events:

Research on Chronic Diseases at Welfare Island; The Sigma Xi Lecture Series at Yale University; Officers of the Washington Academy of Sciences; Awards of the American Society of Civil Engineers; Awards of the American Institute, New York City; The Southwestern Division of the American Association for the Advancement of Science

Scientific Notes and News

Discussion:

"Lodi Man": Dr. A. L. Kroeker. A New Disturbance of Red Pine: John Austin Jump. Selenium Dehydrogenation of Napelline: Dr. E. F. Rogers and Professor Werner Freudenberg. Luther Burbank: Professor W. L. Howard

Scientific Books:

The World around us: Dr. Karl Lark-Horovitz

Reports:

The Reinstatement of Professor Schaper

Surface Motion of Water Induced by Wind

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On August 7, 1927, when about 600 miles from New York on an Atlantic crossing to England I noticed that there were large quantities of floating seaweed, most of which was arranged in parallel lines with a somewhat irregular spacing ranging from 100 to 200 meters. These lines, parallel to the wind direction, which I shall call streaks, often had lengths as great as 500 m. Between these larger streaks, which contained vast quantities of seaweed forming continuous bands 2 to 6 m wide, there were smaller streaks which were made up of detached masses of seaweed along nearly straight lines. At this time the wind was from the north with a velocity of approximately 10 m/sec (22 miles/hr) and the waves roughly 4 m high.

A day later the waves were larger and the streaks of seaweed were still abundant. On the afternoon of this day a sudden change of wind direction occurred (of about 90°); within 20 min all the seaweed was arranged in new streaks parallel to the new wind direction, although the waves continued to move in the old direction.

It was clearly not cohesion between masses of seaweed that held them together in the streaks. At that time it seemed to me that the only reasonable hypothesis was that the seaweed accumulated in streaks because of transverse surface currents converging toward the streaks. The water in these converging currents descends under these streaks. Between the streaks rising currents, upon reaching the surface, flow out laterally toward the streaks.

The action of the wind on the water sets up longitudinal surface currents in the direction of the wind. The effect of the wind is thus to produce a series of alternating right and left helical vortices in the water.