must be greater on the left side than on the right, because on the left side it is restricted to a relatively narrow layer, while on the right side it is spread out over a great depth. The internal boundary between the two water strata will be found at different depths at the edges of the wake stream and in the undisturbed water at some distance; the water columns entering the wake stream must, therefore, undergo deformations, and these will produce vorticity in the surrounding water. It is found that compensation movements are set up in the surroundings of the wake stream; these movements have a component in the direction of the current itself on the right side of the wake stream, while they appear as a counter-current on the left side. Such counter-currents are known along the left edges of the Equatorial Current and the Gulf Stream.

A result of the investigation is that the effect of lateral stresses acting in the direction of the motion must be to produce certain characteristic transverse velocity profiles. No general characteristics of this kind can be deduced from the former theories. If the actual conditions in the sea, as presented by observations, agree on the picture resulting from the theory, it will, therefore, be a valuable support of the whole view. In that case the associated mass (solenoid) distribution in a transverse plane must reasonably be regarded as a result rather than as a cause of the motion.

The second part of the paper contains a number of examples of the conditions in the Gulf Stream area near the American coast, taken from the observations of the "Atlantis." On the whole the temperature-salinity and oxygen-salinity diagrams exhibited seem to bring support to the theory.

The views of Rossby are new, but his theory is far from being complete. However, the general results obtained seem to bring a working hypothesis of high value, and continued work along this line may bring results of great importance in oceanography and meteorology.

Håkon Mosby.

C.-G. Rossby; R. B. Montgomery. "On the Momentum Transfer at the Sea Surface." I: "On the Frictional Force between Air and Water and on the Occurrence of a Laminar Boundary Layer next to the Surface of the Sea" by C.-G. Rossby; pp. 3—20, 4 Figs. II: "Measurements of Vertical Gradient of Wind over Water" by R. B. Montgomery; pp. 21—22, 1 Fig. III: "Transport of Surface Water due to the Wind System over the North Atlantic" by R. B. Montgomery; pp. 23—30, 1 Fig. Pap. in Phys. Oceanogr. and Meteor. Vol. IV, No. 3. Cambridge, Mass., 1936.

The interaction between the ocean and the atmosphere involves a number of difficult but important problems. With previous theoretical investigations as basis, Rossby in Section I of the present paper attempts to apply the theory to the available observational data.

In the case of a laminar sub-boundary layer existing next to the surface of the sea, one may expect the vertical distribution of wind above this layer to obey the general law established by von Kármán for flow over smooth plates. Observations with small wind-velocities and calm sea, such as those given by Montgomery in Section II of the same paper, are found to agree well on this law, and the assumption of a laminar sub-boundary layer thus appears reasonable.

Measurements over land have shown that the wind force usually increases proportionally to the logarithm of the height. Observations by Wüst in the Baltic show a vertical velocity distribution differing from the logarithmic law, giving a marked increase in the slope at 1 m. height. The observations from the lower levels are in good agreement with von Kármán's law, while those from 1 up to 6 m. seem to correspond to a flow over a rough surface, the roughness parameter being about 0·6 cm. The increase in the slope at 1 m. may be explained as follows: —

The horizontal eddy shearing stress at some height above the wave tops must balance the horizontal components of all the forces acting on the air at the surface of the water. These forces consist of true shearing stresses and of the horizontal components of the normal pressures between the air and the water. If the waves are smooth, the horizontal components must be small and the observations will obey von Kármán's law. With stronger wind, the pressure distribution on the sea surface will probably become asymmetric; the normal pressures now have horizontal components which add to the true shearing stress. In this case von Kármán's law applies only to the layer in the immediate vicinity of the water.

The roughness parameter of the sea surface may also be determined from the angle between surface wind and gradient wind, or from the ratio between surface wind speed and gradient wind speed. And it may be determined from observations such as those formerly used by Ekman for determination of the surface shearing stress from storage of water by the wind. Determinations made according to these different methods are given; they all agree on an average roughness parameter of 0·6 cm.

In spite of partly conflicting results obtained by studying the rather scanty observational data, our knowledge of the frictional force between sea and air has increased considerably through Rossby's investigations. It is to be hoped that a more complete collection of observations will soon be made.

Section III is an application of results obtained in Section I and in previous investigations. Montgomery computes the surface winds over the North Atlantic from the mean pressure field for July, hence the transport of surface water at the centre of each five-degree square, and finally the convergence of drift current in cm. per day. The maximum region (15—20 cm. per day) lies between 40° W. and the West Indies, within a few degrees of 17½° N., the values decreasing regularly towards north and east. Near the African coast the convergence is negative, reaching — 34 cm. per day. The results are expected to be discussed more closely later.

Håkon Mosby.

W. Werenskiold. "Coastal Currents." Geofysiske Publ. Vol. X, No. 13. Oslo, 1935.

Die Abhandlung enthält eine praktische Vereinfachung der Methode, mit der man aus dem Massenfeld in einem vertikalen ozeanographischen Schnitt die Stromgeschwindigkeitsverteilung senkrecht darauf ermitteln kann. Man benötigt dabei nichts anderes als die Neigung der Isosteren bezw. Isopyknen in den verschiedenen Schichten, die man den graphischen Darstellungen mit genügender Genauigkeit entnehmen kann. Die Durchführung der Rechnung ist dadurch besonders einfach und elementar geworden. In ähnlicher Weise kann in Erweiterung der Methode mit einem Minimum von Rechenarbeit auch der Wassertransport von Küstenströmungen ermittelt werden. Die Methode wird praktisch an mehreren Beispielen erläutert und scheint tatsächlich die grosse Rechenarbeit der genauen Methode etwas abzukürzen.

A. D.