Association for the Advancement of Science at the time of its meeting in Minneapolis.

The following officers were elected:

President, Dean Edward M. Freeman, University of Minnesota.

Vice-president, Dr. L. M. Gould, Carleton College.

Secretary-treasurer, H. K. Wilson, University of Minnesota.

Councilor, Dr. L. H. Powell, Director of the St. Paul Institute of General and Applied Science.

The next annual meeting will be held in Northfield, Minnesota, with Carleton and St. Olaf Colleges as hosts.

H. K. WILSON,
Secretary

SCIENTIFIC APPARATUS AND LABORATORY METHODS

ON AN ARRANGEMENT FOR STUDYING THE CONDITIONS WITHIN DIFFUSION LAYERS

VERY few experimental studies are concerned with the manner in which the concentrations and electrical potential are built up in the boundary between two different solutions, across which boundary diffusion takes place. From the theoretical side the main interest has so far been the diffusion or liquid junction potential. In order to calculate this potential Planck[1] and Henderson[2] have developed theories which differ in assumptions regarding the ionic composition in the diffusion layer (boundary); Planck's theory, derived from Nernst's[3] treatment of electrolyte diffusion, claims that individual ions may under certain circumstances become accumulated in the diffusion layer in higher concentrations than are present in the two surrounding solutions (*cf.* Plettig,[4] Planck[5]). Henderson, on the other hand, assumes that all ionic concentrations fall off linearly in the boundary. The experimental efforts to settle which theory is valid have, as far as the author has been able to find, used only measurements of the electrical potential (for literature *cf.* Plettig and Planck). The question is hardly settled as yet.

To judge from the theories, however, the evaluation of the ionic concentration distributions within the diffusion layer should offer more conclusive evidence than can be obtained from the potential measurements, which, as a rule, should theoretically not differ much.

Trying to measure the concentration distribution the author first used a diffusion boundary consisting of an agar plug in a glass tube. On the two sides of the plug large volumes of the stirred solution were placed. After a sufficiently long time the plug was sliced in parallel sections and analyses were performed. This method, employed to some extent by previous workers on the "Liesegang structures," however, did not prove to be convenient for observing the development of the final steady state, nor was it good for following the behavior of the potential within the layer.

In order to obviate these disadvantages the following arrangement was adopted: A number of Cellophane or collodion sheets (5 to 9) were clamped between suitable washers in such a manner that about 10 cc of solution could be placed in each of the "chambers" so obtained. The two outside "chambers" were fed continuously with the solutions under investigation by means of a special air-lift suction pump. The content of each "chamber" was stirred. With microanalyses on samples from the "chambers" (apparently corresponding to different surface elements in the diffusion layer) the building up of the concentrations and potential could be conveniently followed. (It should be emphasized that this multimembrane arrangement is not equivalent to one homogeneous diffusion layer from a kinetic point of view. But when the time factor disappears, *i.e.*, in a stationary state, the conditions in the "chambers" correspond to those in the interfaces of a "sliced" homogeneous diffusion layer.) When a 'steady state' was attained (generally within 24 hours) the results of the experiments showed conclusively in all hitherto investigated cases that the behavior of the ionic concentrations, at least qualitatively, was in accord with the Planch-Plettig predictions.

This "multimembrane" method has also been useful in investigations of cases of diffusion where chemical reactions take place.

The details of the results here referred to and some attempts to discuss the biological importance of these rather peculiar conditions in a "membrane" will be published elsewhere.

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[1] M. Planck, *Wied. Ann.*, 40: 561, 1890.
[2] P. Henderson, *Z. physik. Chem.*, 59: 118, 1907.
[3] W. Nernst, *Z. physik. Chem.*, 2: 617, 1888; 4: 154, 1889.
[4] V. Plettig, *Ann. Physik.*, 5: 735, 1930.
[5] M. Planck, *Sitzb. preuss. Akad. Wiss.; Physik.-math. Klasse*, 1930, 367; 1931, 113.

A SIMPLE RELIABLE TIME CLOCK

IT is not infrequent that workers in physiological laboratories supplied with direct current, where syn-