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-

chronous motors can not be used, feel a very acute need for an inexpensive, transportable time clock to activate more than one time signal. A device fulfilling these specifications has been in use in this laboratory for the past year and has been found reliable and accurate. The apparatus has a further advantage in that it is inexpensive, costing, exclusive of the mechanic's time, less than $15.00.

It is essentially a rotating switch driven by means of a direct current electric phonograph motor. These direct current motors may be obtained regulated by a governor to run at a normal speed of 78 revolutions per minute. This speed, however, may be increased or decreased by as much as twenty revolutions per minute in either direction. Hence it is possible to regulate the motor to obtain one revolution per second. For our ordinary laboratory work we use two models and find them adequate for most physiological class work. The first, so regulated as to produce one revolution per second, drives a rotating spring contact directly. The second has the shaft speed reduced by means of a worm and gear to one revolution per minute. In both cases the rotor makes a contact every 90°. Thus, in the direct drive, signals are given at 1, 0.5 and 0.25 second. The second model gives signals at one minute or 30 seconds or 15 seconds. It is used primarily for either slow muscular contractions, *i.e.*, uterine, or for respiratory or metabolic determinations. The details of the rotating switch and its electrical connections are given in Fig. 1.

The rotor is fastened directly to the shaft, which is also grounded to the battery. The circuit is closed when the rotor strikes one of the four induction switch

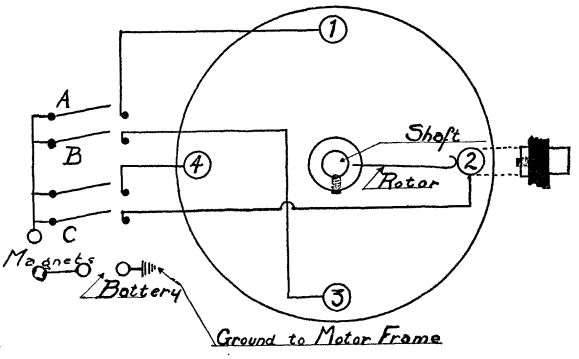

FIG. 1

points (1–2–3–4). These points are inserted 90° apart in a vulcanite disk.

Thus, closing switch A or B, one contact per revolution is made, closing the double pole switch (C) gives two equidistant contacts, closing all switches causes four contacts or a minimum time interval. It has been found advisable when a heavy electrical load is placed upon the contacts to use a two microfarad condenser in order to reduce the spark and so preserve the smoothness of the contacts. The entire unit is most compact. Even with the relatively large reducing gear it may be enclosed in a small box and easily transported from laboratory to laboratory. Since the motor is very quiet we have found it advisable to connect a small lamp in the motor circuit as an indicator to prevent battery wastage.

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H. LEWINE

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SPECIAL ARTICLES

MUTATION RATE FROM OLD DATURA SEEDS

THE cytological aberrations in root-tips of *Crepis* plants from aged seeds, found by Navashin,[1] seemed to point to an influence on mutation rate by conditions that might be obtained in nature. Last year we reported high rates of pollen abortion mutations from seeds of *Datura stramonium* that were aged by storing up to ten years in the laboratory.[2] The same material has since shown that aging seeds induces also a high rate of visible recessive mutations.[3] Later, through the cooperation of H. B. Derr, county agent at Fairfax, Va., we obtained seeds that, apparently, had been buried for 22 years in the soil beneath a house.

These seeds, so far as we are aware, are the only material of the kind which has been subjected to genetic study. In view of the suggestions from earlier work that mutations induced by aging seeds may play a rôle in evolution in nature, it seems desirable to give the evidence upon which we base our belief that these seeds had remained undisturbed for at least 22 years. The house under which the seeds were found was built about 1909, and was bought by Mr. Derr in 1911. The kitchen was added in 1912. In 1924 a cellar was dug beneath part of the house in order to install a furnace. The excavated soil, piled outside, yielded a large crop of vigorous jimson weeds. Ten years later, in the spring of 1934, Mr. Derr took some soil from under the house and again obtained a number of jimson weeds. In June, 1934, one of us visited Mr. Derr's

[1] M. Navashin, *Nature*, 131: 436, 1933.

[2] J. L. Cartledge and A. F. Blakeslee, *Proc. Nat. Acad. Sci.*, 20: 103–110, 1934.

[3] A. F. Blakeslee and A. G. Avery, Abstract, *Amer. Nat.*, 68: 166, 1934.