in the courts. The great progress which has been made in the national and local cooperative movements now being carried on between the various wire-using utilities seems to justify this conclusion.

With the necessarily limited treatment which many of the subjects receive, it is obviously possible to raise the question as to whether some of the things which are omitted are not equally or more important than those which are included. The bearing of this and some of the other comments on the usefulness of the book in particular courses is naturally somewhat dependent upon the ideas of the instructor as to what he desires to teach.

To the matter of the justification for trying to teach in college a particular business to the student, and specifically in this case the telephone business, much thought has been given by various educators and engineers. From the standpoint of many communication engineers, the conclusion has been that such an attempt is not justified and that the instructor would do better to endeavor rather to impart to the student a good understanding of fundamental principles. A working knowledge of the theory of propagation of electric waves, for example, is useful not alone in telephone work but also in other fields. The instruction in this theory should be accompanied by illustrations of its various applications. Messrs. Wright and Puchstein have provided considerable material for such illustrations drawn from the field of telephony.

Despite questions, such as those indicated above, which can be raised against parts of the book, it will undoubtedly serve a useful purpose as an instruction manual since much of the material is distinctly an addition to that hitherto available for student use.

Le métabolisme de base. By ÉMILE F. TERROINE (Strasbourg) and EDGARD ZUNZ (Bruxelles). Presses universitaires de France, 1925, pp. 1–187.

THIS is the best book on the subject of metabolism published in a foreign language. It deserves high commendation on account of its full consideration of world literature, a treatment nowadays so unusual as to warrant special praise. It is indeed a pleasure to read in the French language exact reports of the work of Rubner, Benedict, Du Bois and others. An excellent critical review of the law of surface area as the standard by which basal metabolism may be measured leads the authors to the acceptance of this standard. Possibly more space than is necessary is devoted to the discussion of Newton's law of cooling as being the determinative factor in basal metabolism, because for many years no one has so considered it. The reviewer notes with regret, but not surprise, that his own experiments on the specific dynamic action of sugar and amino-acids are not fully understood. The cost of this excellent volume is 20 francs (94 cents), which is in striking contrast to charges inflicted upon foreigners by German publishing houses.

GRAHAM LUSK

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE AND EFFICIENT HYDROGEN ELECTRODE

THE writer, during his studies of the hydrogen ion concentration of certain Hawaiian soils and pineapple plant fluids, constructed a hydrogen electrode which proved very efficient and satisfactory in every respect for the work. This electrode was found to reach equilibrium in relatively less time than certain other well-known electrodes, and it is on account of this single merit that a description of its construction and operation is given herewith.

The principle on which the electrode is operated does not differ from that of other forms. The con-

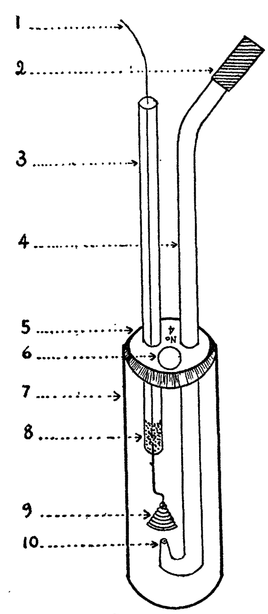

FIG. 1

struction of the entire apparatus (Fig. 1) is very simple. It consists of a cell (7) made of a flat bottom glass tube 7.5 cm long and 2.5 cm in diameter, an electrode supporter (3) made of a glass tube 10 cm long and 0.5 in diameter, a hydrogen gas conductor (4) made of glass tubing, 15 cm long and 0.5 in diameter, and a No. 4 rubber stopper (5) through whose three holes are suspended the electrode-supporter, the hydrogen-gas-conductor and the salt bridge or glass tube containing either concentrated KCL solution or agar-KCL. It is necessary that the electrode supporter and hydrogen-gas-conductor fit tightly and the salt bridge loosely in the rubber stopper, the reason for the latter being to provide an exit for the escaping hydrogen gas. The electrode (8), of a conical form, may be made by twisting a 15–25 cm long 22 gauge platinum wire (other gauges of greater diameter may be used) around the apex of a conical object, leaving at the same time an open space between the turns of the wire of from 1 to 1.5 mm and one at the apex about 2 mm in diameter. The open spaces are left for the purpose of allowing the hydrogen gas to pass through and thus bathe the entire surface area of the electrode. The length of the wire extending above the apical end of the cone-electrode should ordinarily measure about 2 cm, 0.5 cm of which is fused into the basal end of the electrode supporter, where it comes in contact with the mercury (8) enclosed therein. Connection between the electrode and the potentiometer is made by means of a copper wire (1). The hydrogen-gas-conductor, as seen in Fig. 1, forms a curvature of 180 degrees at the basal end, terminating in a point whose aperature should ordinarily be between 0.75 and 0.50 mm in diameter (10). The pointed end of the hydrogen-gas-conductor should always be situated directly opposite the center of the hollow base of the electrode, the distance between the two not exceeding 1–2 mm. Connection between the hydrogen-gas-conductor and hydrogen gas generator is made by means of a rubber tube (2). The hydrogen-gas-conductor should always be disconnected from the rubber tube (2) at the end of each determination, the basal end turned to the side of the cone-electrode by twisting, rinsed with distilled water and then returned to its proper position.

For cleaning or platinizing the electrode, the electrode supporter should be removed from the rubber stopper; this precaution is essential because of the influence of the gases, liberated during both processes, on the rubber stopper.

The short period of time required for an electrode of this type to reach equilibrium may be due to the great surface area which it exposes. The surface area of a 15 cm length of 22-gauge platinum wire electrode is about 2.2 square centimeters and that of a 25 cm length 3.75 square centimeters. A surface area between 2.2 to 3.75 square centimeters for such an electrode is considerably greater than that possessed by other types of electrodes. The shape of the electrode is also advantageous because it receives all the hydrogen gas as it is delivered by the conductor, distributing it at the same time over its entire surface by the helicoid movement of the gas. The hydrogen-gas-conductor, because of its position near to the bottom of the cell, is able to produce considerable agitation of the contents of the cell (solution) by the upward movement of the bubbles of hydrogen gas. Such an agitation is of great advantage because it brings all the parts of the solution in contact with the electrode and at the same time does not necessitate the use of a mechanical shaker.

The volume of the solution that is generally needed for the determination of the hydrogen ion concentration with the above apparatus is between 5 and 10 cc. It is possible to adapt the apparatus for smaller volumes of solution by using a smaller cell and mounting the electrode supporter and hydrogen-gas-conductor on a rubber stopper of smaller diameter. The writer does not, however, recommend the use of smaller volumes of solution than 5–10 cc., because of the rapid changes to which such smaller volumes of solution are subjected by rapid changes in the environment.

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SPECIAL ARTICLES

INACTIVATION OF INSULIN BY GLUCOSE WITH A COMMENT ON THE GENESIS OF DIABETES[1]

The inactivation of insulin by hydrogen and hydrogen sulphide and its reactivation by exposure to oxygen, recently reported from this laboratory,[2] suggested the possibility that the pancreatic hormone might be inactivated by reducing sugars, thus explaining their antidoting effects and conceivably throwing some light on the genesis of diabetes. This conjecture was very promptly turned to reality; for upon the second trial it was found that the power of insulin thus treated *in vitro* to lower the blood sugar of normal fasting rabbits was very much weakened. Further experiments in which insulin and glucose were incubated together proved even more convincing.

A fairly pure insulin A_3P_5 (meaning purified by five reprecipitations with amyl alcohol) and Merck's C. P. dextrose were used. The dosage was identical in all tests. Likewise the amount of glucose in the controls was always equal to that used in the crucial experiment. The control was accomplished by injecting the glucose solution on one side of the animal's

[1] From the Department of Vital Economics, University of Rochester, Rochester, N. Y.

[2] Allen and Murlin, Proc. Soc. Exp. Biol. and Med., 1925, XXII, 492.