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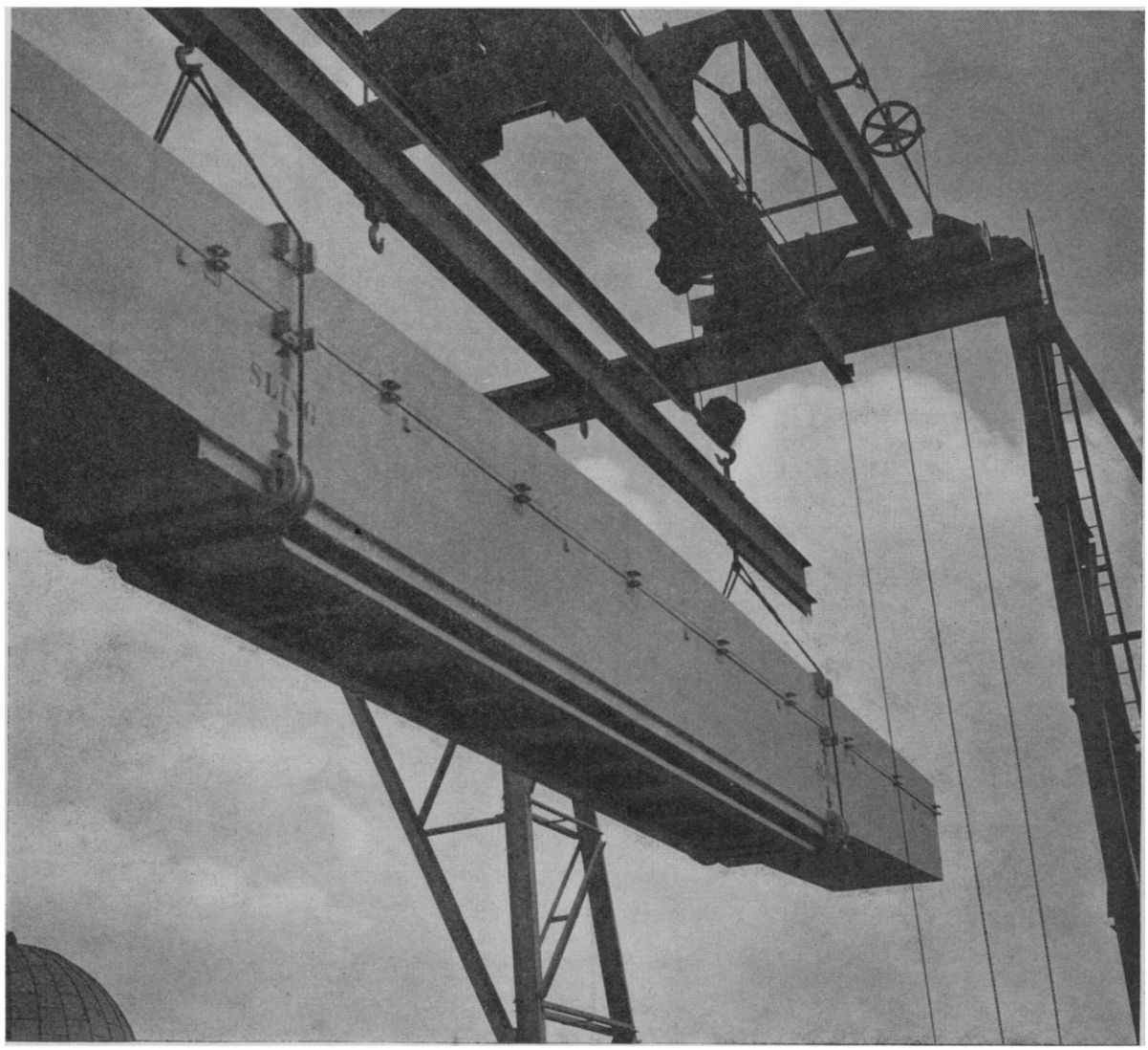

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THE IMPORTANCE of choline in nutrition is now more widely recognized as a result of new investigations showing its relationship to liver cirrhosis[1] and renal damage.[2] Under specific dietary conditions a deficiency of choline results in fatty infiltration of the liver in rats[3] and perosis in chicks.[4] Choline is definitely involved in the metabolism of the sulphur containing amino acids.[5, 6]

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SUCCESSES AND FAILURES OF EXPERIMENTAL PSYCHOLOGY[1]

By Professor R. S. WOODWORTH

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IT is customary to claim for psychology that, while it has a long history as a branch of philosophy, it can be excused for a considerable degree of immaturity because of its youth as a branch of experimental science. As the decades go by this excuse becomes less and less convincing. There are several very active and successful sciences, as physical chemistry and bacteriology, which are really younger than experimental psychology. If these sciences have made more rapid progress than psychology, the reason may be that they are working with phenomena that lie further from everyday experience, so that their discoveries are more striking. Other reasons can be suggested. Possibly psychology has undertaken a harder job, a more complicated problem to unravel—or possibly psychologists have not been making good use of their time. At any rate psychology should be able by now to point to substantial achievements won by use of experimental methods, along probably with a number of failures which may be quite instructive in themselves. It would be too much to attempt here and now to answer the question, how much has been achieved by experimental psychology in the half century or more of its existence. We can only touch a few high (and low) spots in the hope of conveying some idea of the progress of psychology as it appears to those who are actively interested in pushing it forward.

[1] Annual Sigma Xi address, Indiana University, March 13, 1941.

.015 glass capillary of the glass electrode should be of a length and inside bore to hold approximately 0.3 ml of fluid. The electrodes which we made averaged about four inches in length. The jacket of the electrode is extended to form a funnel 20 mm high and 25 mm across the top. The space at the bottom of the funnel is ground to accommodate a standard ground tip of a 1.0 ml hypodermic syringe. The hypodermic syringe is of the insulin type—long with a solid plunger, modified as follows: a 1 millimeter hole is drilled through the wall of the syringe, 2 mm above the last graduation and a short groove 2 mm long is cut in the lower end of the solid plunger.

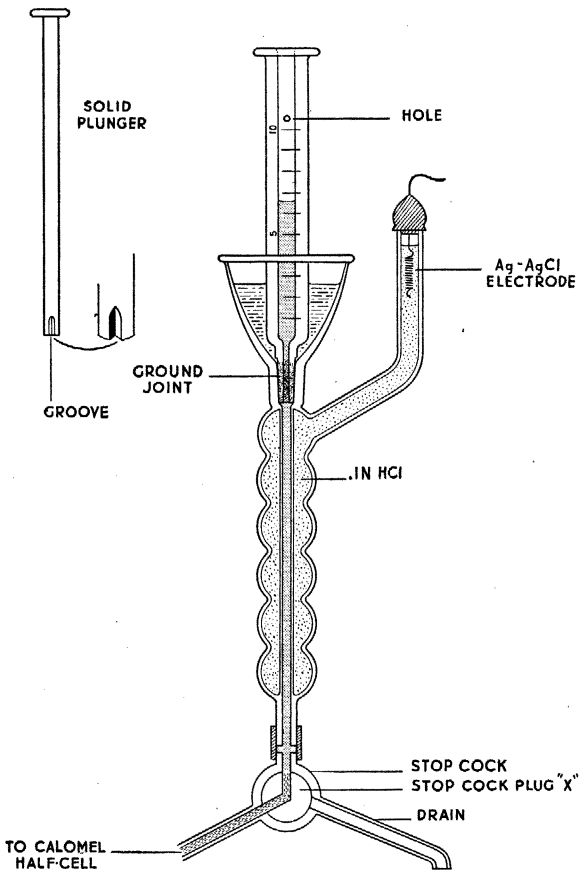

FIG. 1

METHOD OF OPERATION

The glass electrode is set up in an electrically shielded copper box connected by shielded cables to a type #7660 Leeds and Northrup Company pH indicator. After the glass electrode has been calibrated for acetate buffer pH 4.64 it is thoroughly washed out with distilled water. The stop-cock (Fig. 1, X) is then closed so that the distilled water fills the electrode and extends halfway up the funnel.

The material to be studied is introduced into the hypodermic syringe, care being taken to see that the groove in the solid plunger is oriented 180° from the hole in the syringe wall. In the case of pure cultures of protozoa the material is secured through a sterile needle introduced into a vaccine port blown in the side of the culture flask.[3] The needle is removed from the syringe and the syringe tip is introduced through the distilled water in the funnel and seated in the ground joint at the upper end of the glass electrode. This effectively seals off the distilled water in the funnel and places the culture medium in the syringe in direct contact with the column of distilled water in the glass electrode, without the possibility of any air bubbles being formed in the system. The plunger of the hypodermic syringe is now turned 180 degrees until the slot and the hole in the syringe coincide. The plunger may now be withdrawn without exerting pressure on the fluid. By carefully opening the stop-cock (Fig. 1, X) 0.3 ml of the culture medium is allowed to displace the distilled water in the electrode. The amount is determined by following the meniscus on the graduations of the syringe. The stop-cock (Fig. 1, X) is now turned to make a liquid junction and a determination is made. Two more determinations are made with the remaining available fluid. The syringe is then removed and the electrode again thoroughly washed with distilled water.

C. LLOYD CLAFF

ARNOLD BIOLOGICAL LABORATORY, BROWN UNIVERSITY, AND MARINE BIOLOGICAL LABORATORY

[3] G. W. Kidder, *Physiological Zoology*, 14: 209, 1941.

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