SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE DROP RECORDING SYSTEM

MANY types of drop recorders have been devised. Most are difficult to maintain. Some utilize the force of the falling drop, while others utilize the conductivity of the drop to complete an electrical circuit. With the usual arrangement in the case of the latter a sensitive relay is required to actuate the recording device.

By the use of a bell-ringing transformer actuated by house current in place of the relay, the apparatus becomes entirely free of troublesome contacts and moving parts. This has the advantages of being simple, non-mechanical, sensitive to electrolyte solutions of low concentration, easy to construct and maintain, and useful under a wide variety of conditions. It is made of a few common pieces of inexpensive and readily available equipment.

The electrode gap of a conventional falling drop "capsule" such as that described by Gibbs[1] is arranged in series with the primary of an ordinary A-C bell-ringing transformer and a 110 V A-C source; the 6-10 volt secondary actuates the recording device. The drop (1 per cent. NaCl solution) closes the electrode gap in the primary circuit. It is displaced from a flask of suitable size by the fluid whose rate of flow is being studied. The fluid system is closed and air excluded from it. There is virtually no evolution of gas at the primary gap because of the alternating character of the current. Considerable dilution of the electrolyte solution is possible before effective conductivity is impaired.

In classroom demonstrations, the kymographic record of the drops is not clearly visible to students at a distance. Therefore in demonstrations we also use an electric light bulb which flashes when contact is made. This is provided by placing a 7½ watt 110 V lamp between the electrode gap and the transformer primary, in parallel with the primary.

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A SIMPLE METHOD FOR QUIETING PARAMECIUM AND OTHER SMALL ORGANISMS DURING PROLONGED OBSERVATION

Paramecium is notoriously difficult to immobilize while alive. This is evidenced by the papers of J. S. Lee[1] and J. B. Buck[2] presenting beautiful though somewhat elaborate methods to bring this animal under control.* Consequently it seems worth while to record a very simple but effective technique adapted from Lieutenant W. G. Downs,[3] who originated the method in connection with preserving Giemsa blood films and quieting mosquito larvae.

A solution of completely hydrolyzed, medium viscosity polyvinyl alcohol is prepared by stirring the powdered alcohol into water until the solution is as thick as heavy molasses—approximately 12 to 14 grams of dry alcohol in 100 cc of water. This should be done over a steam bath and the solution left until all bubbles rise to the surface after which the solution will be glass clear. The solution should then be poured into a wide-mouthed stoppered bottle where it will keep indefinitely. The above holds for "Type B Grade RH-349-N" available at about $1.00 a pound from the E. I. du Pont de Nemours Company, Electrochemicals Department, Niagara Falls, N. Y. Other forms of polyvinyl alcohol, e.g., grade "RH-349-N," can be used but go into solution with much more difficulty and remain cloudy.

In use, two drops of a thick suspension of paramecium, as from a rich boiled lettuce culture,[4] are placed on a slide and two drops of the polyvinyl alcohol solution added. The whole is thoroughly stirred with a needle and covered with a cover glass. The animals are brought almost to a standstill at once and will remain so in good condition for over four hours. Abrupt and striking reversals of ciliary beating and many other details are clearly visible. The frequency of pulsation of the contractile vacuoles usually becomes slower after three hours. The cover glasses are self-sealing because the polyvinyl alcohol dries to form a firm membrane that prevents further evaporation. The slides can be cleaned merely by soaking briefly in water.

Stentor coeruleus presents a handsome object when immobilized by this method. The same holds for the larger hypotrichs and various small aquatic oligochaetes like *Nais* and *Chaetogaster*.

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[1] O. S. Gibbs, *Jour. Lab. and Clin. Med.*, 12: 686, 1926–27.
[1] J. S. Lee, SCIENCE, 94: 332, 1941.
[2] J. B. Buck, SCIENCE, 97: 494, 1943.
* While this was in press a valuable additional paper appeared. D. A. Marsland, SCIENCE, 98: 414, 1943.
[3] W. G. Downs, SCIENCE, 97: 539, 1943.
[4] L. H. Hyman, *Trans. Amer. Micro. Soc.*, 60: 370, 1941.

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