of winter bird records in Iowa by T. C. Stephens and William Youngworth showed a larger winter list than expected. Walter W. Bennett emphasized what should be studied and recorded about birds in Iowa now. George O. Hendrickson's "Teaching of Biology in Iowa Schools" awakened keen discussion.

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Secretary

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN APPARATUS FOR THE PREPARATION OF SMALL ORGANISMS

THE apparatus herein described permits the preparation of micro-organisms and small whole mounts in such a manner that (1) the change in concentration of a reagent and from one reagent to another is gradual, (2) the organisms remain on the same cover glass without the application of an adhesive agent from the time they are killed until the process of mounting is completed and (3) the objects may be viewed under the microscope during any stage of the process.

DESCRIPTION

A block of wood (Fig. 1) supports three vertical cylindrical rods each ¼ in. in diameter and 20 cm

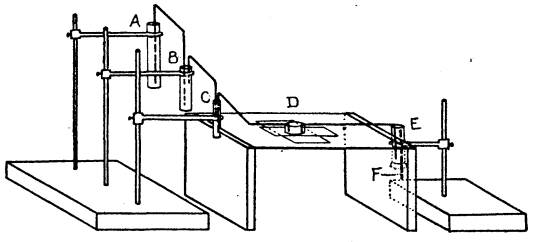

FIG. 1

long. An arm 11 cm long extends horizontally from each rod. One end of the arm bears a spring clamp for the securing of a small shell vial, the other is fitted with a collar and set screw permitting easy adjustment of its position on the vertical rod. The three shell vials *A, B, C,* of a size appropriate to the demands of the technique used, are connected by small capillary tubes. From vial *C* a capillary leads into the chamber *D* containing the organisms. The glass capillary which serves as an outlet from this chamber leads into the constant level device at *E*. The latter consists of a glass cylinder 1.5 cm in diameter and 5 cm long. At the bottom is a cork through which is inserted the capillary shown at *F* which is somewhat greater in diameter than that of the outlet capillary from *D*. The height of the top of the capillary *F* is equal to the fluid height desired in the chamber. The chamber *D* is elevated on a glass-topped table, the dimensions of the latter being adequate to permit the insertion of a microscope stage so that the preparation may be within the field of the objective.

THE REAGENT CHAMBER

This part of the apparatus (Fig. 1, *D* and Fig. 2) consists of a clamp formed of two brass plates 4 cm

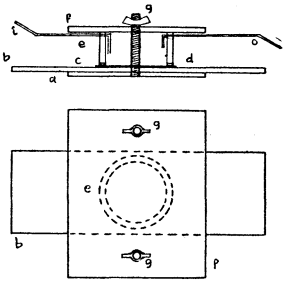

FIG. 2

by 5 cm, each of which is drilled through the center with a circular hole 21 mm in diameter. Two pillars, shown at *g,* fashioned from No. 8–32 by ⅞ in. brass machine screws are set 3.5 cm apart on the median long axis of the lower plate *a,* and corresponding holes at *g* are drilled in the upper plate so that it may be slipped over the pillars and clamped by wing nuts. A 1 in. by 3 in. glass slide *b* is placed on the bottom plate between the pillars; at *c* is a 22 mm square cover glass over which lies a thin circular cork washer *d* with internal and external diameters of 20.5 mm and 22 mm respectively. Upon this washer is placed a glass cylinder *e* 8 mm high, the circular dimensions being the same as those of the cork washer. The upper and lower surfaces of the cylinder are ground in order that the faces may be smooth and parallel. At opposite ends of a diameter, on the upper surface of the cylinder, areas are filed away sufficiently large enough to permit the intake *i* and outlet *o* capillaries to enter the chamber without extending above its surface. The intake and outlet capillaries are sealed to the chamber at their points of entrance with dental cement. The chamber is made fluid tight by adjusting the upper brass plate over the cylinder and firmly and evenly clamping it by means of the wing nuts at *g*.

METHOD OF OPERATION

The organisms are introduced into the chamber and the killing agent applied with a pipette. The reagent to follow is placed in vials *A, B, C* (Fig. 1). From then on, changes in reagents or concentrations are made in vial *A*. Vial *B* is a preliminary mixing chamber, and vial *C,* usually much smaller than the

other two, completes the solution or equalization of the reagents.

After the final process of clearing is complete, the excess reagent is removed from the chamber by a pipette, the clamp is released and the cover glass inverted over a drop of balsam placed on a slide.

Corks with holes for the entrance of the capillaries may be placed in the vials to prevent evaporation, also a large cover glass should be placed over the chamber when the process is not being observed under the microscope. If a capillary fails to function because of the presence of air bubbles, the intake capillary of the vial from which it leads is removed. Then, a mouth pipette is inserted through its place in the cork and an air pressure exerted sufficient to cause the resumption of flow through the capillary.

The flow into the chamber containing the specimens is so gradual and the mixture of the reagents entering it has been found to be so complete that small protozoa will remain stationary on the cover glass and not be carried by convection or solution currents into the drain leading from the chamber.

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SPECIAL ARTICLES

THE EXPERIMENTAL TRANSMISSION OF YELLOW FEVER BY MOSQUITOES[1]

FOR many years yellow fever has been one of the most dreaded of the diseases menacing the human race in the warmer parts of the western hemisphere. The rapid conquest of its frontiers has been one of the great achievements of modern warfare on disease.

Ever since the memorable work of the American Commission (Walter Reed *et al.*) established *Aedes aegypti* as an essential host in the yellow fever cycle, epidemiological studies and palliative measures have revolved about the domestic relationships of this so-called yellow fever mosquito.

In addition to experiments with this species, the Americans[2] in Cuba and the French Commission[3] in Brazil, using human volunteers, attempted the passage of yellow fever through *Culex quinquefasciatus* (= *fatigans*), an important human pest widely distributed in the tropics. The French Commission also undertook transmission experiments with *Aedes scapularis, A. taeniorhynchus, Psorophora ciliata* and *P. posticata.* None of these experiments were successful.

More than two decades later, in West Africa, Bauer[4] carried out the first successful transmission experiments with species other than *A. aegypti.* The belief that the dreaded "yellow jack" was transmitted solely through the agency of the notorious *Stegomyia* mosquito had been of so many years' standing that the experimental transmission of the virus of this disease by several other species of mosquitoes came as a rather startling confirmation of the predictions of the late Dr. H. R. Carter.

In Dr. Bauer's experiments, *Aedes* (*Stegomyia*) *luteocephalus, A.* (*Aedimorphus*) *stokesi*[5] and *Eretmopodites chrysogaster* were allowed to bite infected rhesus monkeys. After an adequate incubation period, these insects were induced to feed on normal animals and were injected into other test monkeys. All produced fatal infections in the test animals. *A. apicoargenteus* did not transmit the virus. The negative results with this mosquito, a *Stegomyia,* and the positive findings for *Eretmopodites* are especially remarkable.

Continuing studies on West African species I added to the list of experimental vectors three more stegomyiae, *viz., A. africanus, A. simpsoni* and *A. vittatus,* as well as an important domestic mosquito of another genus, *Teaniorhynchus* (*Mansonioides*) *africanus.*[6] *Anopheles gambiae,* the chief malaria carrier of the region, fortunately proved to be incapable of maintaining the virus of yellow fever in its system through the accepted incubation period.

Several other species with which I made transmission tests (unpublished) produced no reaction by bites, but injections of saline suspensions of the vicious crab-hole mosquitoes, *A.* (*Aedimorphus*) *irritans* and *A.* (*A.*) *nigricephalus,* as well as of *A.* (*Banksinella*) *punctocostalis* and *Culex thalassius,* resulted in fatal infections, after the elapse of adequate incubation periods following the initial infecting meal. I was also able to confirm transmission of the virus by *A. luteocephalus.*

In view of the findings in West Africa Davis and Shannon[7] recently reopened the question of the pos-

[1] The studies and observations on which this article is based were conducted in Lagos, Nigeria, with the support and under the auspices of the International Health Division of the Rockefeller Foundation.

[2] W. Reed, J. Carrol and A. Agramonte, Senate Document No. 822, 1911, 110.

[3] E. Marchoux and P.-L. Simond, *Ann. Inst. Pasteur,* 25: 23, 1906.

[4] J. H. Bauer, *Amer. Jour. Trop. Med.,* 8: 261–282, July, 1928.

[5] A correction in name from the original report of *A. apicoannulatus* as pointed out by Evens, *Ann. Trop. Med. and Parasit.,* 23: 521, 1929.

[6] C. B. Philip, *Am. Jour. Trop. Med.,* 9: 267, 1929; 10: 1, 1930.

[7] N. C. Davis and R. C. Shannon, *Jour. Exp. Med.,* 50: 803, 1929.