

instrument have been mounted in a special metal case (A) and only 110-volt alternating current is required.

The light source (7) for density measurement is centered in a new type vertical x-ray illuminator (C). Controls (D, E, F, G and H) are grouped on the right-hand panel, and the galvanometer (I) is in the same case to the left. A vertical arm (1) mounting a photo-E.M.F. cell (2) for measuring the light transmitted by any square mm area of film is hinged to turn out of the way while the illuminator is used for other purposes. A brass cone (3) with its interior surface chromium-plated and a 1 mm circular opening at the apex is fitted over the cell. The film (4) is held in place by hinged rubber-tipped arms and can be moved freely to place any desired portion under the cone aperture for density measurement. In the new x-ray illuminator mentioned above, two 18-inch tubular fluorescent bulbs (5) in the special reflector (C) provide a cold blue light for the flashed opal glass (6).

A 150-watt floodlight bulb (7) in the optical system is directed toward the large end of an aluminum cone (B) which contains two glass filters (8, 9), two condensing lenses (10, 12) and a disc of lucite (11), to project an intense spot of cool monochromatic light on the opal glass. A rheostat (H) and voltmeter (J) in the bulb circuit provide a control for intensity of the spot, and a voltage regulator is employed to reduce line voltage variations to ± 1 per cent. at all values. Heat generated by the bulb in the optical system is dissipated by well-directed streams of filtered air from a rotary fan (K), thus keeping the temperature rise at the film to 9° C. above room temperature under the most intense light. Cell output current is registered on the sensitive portable galvanometer (I) of reflected-beam, enclosed-spotlight type.

A calibration table has been made which permits relative tissue density values, based on absolute film densities, to be noted at a glance for each millimeter of galvanometer deflection. Effects of variations in exposure time, developing and emulsion are suppressed by subtracting the reading for a standard film area from each other reading on that film. The total range of the instrument in units of film density is from 0.3 to 3.0, which includes all the x-ray films in our files.

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METHOD OF EMBALMING LARGE INSECTS¹

ANY one who has mounted numbers of grasshoppers or other large insects appreciates the difficulties encountered in drying the specimens without deterioration, discoloration or destruction by the larvae of flies.

¹ Contribution No. 205 from the Department of Zoology, University of Oklahoma, Norman.

The following technique was devised by the writer to improve the quality of dried insect specimens by eliminating the difficulties mentioned above. Although the method is original as far as the writer is concerned, others may have suggested similar procedures.

An embalming fluid is prepared as follows:

- 60 ccs of toluene (or xylene)
- 25 ccs of tertiary butyl alcohol
- 15 ccs of ethyl alcohol
- 5 grams phenol
- 20 grams paradichlorobenzene
- 10 drops of balsam in xylene as used in microtechnique

Mix the ingredients in the order named.

The fresh specimen is injected by inserting the needle of a hypodermic syringe in a posterior abdominal segment and running it forward to or into the head, then slowly withdrawing the needle while injecting the fluid. Care should be taken not to force too much fluid into the body cavity at once, as the abdominal segments may be ruptured. After injection, lay the specimen aside a few moments, then pin it in position on a drying board and place in an open place for twenty-four or more hours.

The writer has found that the largest grasshoppers will ordinarily dry in less than forty-eight hours following this treatment. No color changes occur in the injected specimens.

The fluid may also be used as a preservative without injection by merely dropping the specimens into a jar and covering with the liquid. Green-colored grasshoppers bleach somewhat if stored in the fluid. I have other specimens which were stored in the fluid for over a year, then dried, which show very little color change.

Museum pests, mice and flies are effectively repelled by this treatment.

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BOOKS RECEIVED

- ANDERSON, ARTHUR K. *Essentials of Physiological Chemistry*. Second edition. Pp. ix + 323. 36 figures. Wiley. \$2.75.
- CLEMENTS, F. E. and V. E. SHELFORD. *Bio-ecology; A Correlation of the Fields of Plant and Animal Ecology*. Pp. vi + 425. 85 figures. Wiley. \$4.50.
- EGGELING, W. J. and C. M. HARRIS. *Forest Trees and Timbers of the British Empire; Vol. IV, Fifteen Uganda Timbers*. Pp. 120. 15 figures. 16 plates. Oxford University Press. \$2.50.
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