

logical processes become the special object of research.

Less satisfactory than the experimental technique is the statistical treatment of the results. Serious objection must be taken to the misuse of the average. It is wholly misleading, for instance, to give 22 as the average of the three measurements, $+85$, -9 and -11 . This figure is held to show that three so-called psychopathic subjects, *i. e.*, men who had been intemperate, did not differ to any extent from seven normal subjects. Really, the figures only show that of three formerly intemperate subjects one was far more sensitive than usual to the depressing effects of alcohol on the eyelid reflex, while the other two subjects resembled one out of the seven normal men in showing the stimulating effect of 30 c.c. of ethyl alcohol. This and other measurements on the intemperate subjects serve to confirm the statements made in their personal histories, that one was unusually sensitive to the influence of alcohol, while the others were less sensitive than usual, not, it is probable, on account of psychopathy, but through their former habituation to the action of alcohol. In so far as any weight can be attached to the apparently stimulating effect of alcohol in these two subjects, it may have been due to the satisfaction of a craving.

This work is the first contribution to an investigation of the action of alcohol which it is to be hoped may extend over many years and go far to settle a number of obscure and difficult problems. I have ventured to call attention to certain points of methodology and workmanship which seem to require reconsideration because in such an investigation principles and methods can not be too closely scrutinized at the outset. The criticisms now offered must not be allowed to obscure the recognition of the great value and promise of the work.

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Typical Flies—A Photographic Atlas of Diptera, including Aphaniptera. By E. K. PEARCE. Cambridge (England), University Press, 1915.

This royal octavo, bound in boards, contains 4 pages of preface, 4 pages of classification; 45 pages of half-tone reproductions from photographs, comprising 155 figures representing 125 species distributed in various families, including 4 species of fleas, and 3 fly habitats; concluding with 2 pages of index. Under the figures are given technical name of the species, common name, if any, length of body, wing expanse, with brief data on habits and habitats.

The book is intended to fill the place of a pictorial elementary treatise. The plan is an excellent one, but difficult of proper execution. The author complains of the difficulties which he encountered in obtaining suitable material for photographic reproduction. Nevertheless, the figures are all quite recognizable, which is the main requisite to the success of the plan. The feature of including habitat photographs is commendable and might have been farther pursued.

There is no doubt that the wings and legs of flies must be spread in order to photograph them to the best advantage, but care must be exercised to secure natural attitudes, just as in the mounting of birds, mammals and other animals. Otherwise the reproductions are not true to nature but leave a marred image upon the memory, which appreciably reduces facility of recognition of the species in its habitat.

Recommendations made by the author in his preface regarding methods of mounting are open to objection. Aside from material for photographing, and the proper setting of the proboscis and hypopygium for study in certain forms, the reviewer decidedly favors leaving all flies in the natural attitudes assumed by them in the killing bottle. Specimens too small to be pinned with a No. 2 pin should be mounted on minute wire elbows wound on No. 3 pins. Only 34 to 39 mm. pins should be used, longer sizes giving trouble in the standard-depth cases. Great care should be taken not to get the specimen too high on the pin, but to leave sufficient room for grasping the head of the pin with the thumb and finger without danger of contact with the wings or other parts. There should be left sufficient space on the pin below the specimen for several labels, which

should be right side up that they may be read without the necessity of removing the specimen from the tray or case. In no instance should flies be gummed or mounted in any manner on cards, which are certain to obscure important characters.

Revision of other recommendations which occur in the preface should be made. Fine-mesh bobbinet is the proper material for nets; and white is the preferable color, facility of locating the fly in the net after capture outweighing any element of alarm to the fly prior to capture. In fact, the white net is very attractive to many flies, rare species often alighting thereon voluntarily in the field. As to size, the 22-inch diameter bamboo ring set in an unjointed three-foot light wooden handle is the most effective, specimens rarely escaping it even if the cast is made during flight. This is the net used by the veteran English field-naturalist, Mr. A. E. Pratt, in South America and New Guinea. It is sufficiently light to be easily wielded in one hand, and performs exceptional service.

The fly is best transferred directly from the net to the cyanide vial. The latter should be the 25 x 100 mm. flat-bottom clear-white shell vial, the cyanide enclosed in a wad of tissue paper and tightly wedged into the bottom, shredded tissue paper being placed loosely in the vial to prevent undue rubbing and contact of specimens, and closed with a soft cork stopper. Large and small flies should go in separate vials; such forms as bombyliids with pile that is easily detached must be kept separate, as well as culicids and other forms that might be injured by stouter flies or that might mess others with their scales, pile, exudations, or pollen. The judgment of the collector must guide him, and he should carry a liberal supply of the vials. The specimens may be left all day in such vials without injury, but should be pinned the same evening or at latest next morning. In dry climates they will not last well over night.

In giving measurements of flies, the length of one wing, and not the expanse, should be stated. The expanse is not a stable quantity, due to drying and faulty spreading; moreover,

the wings of study material should not be spread.

As to the classification adopted, it is especially important to present a correct system in a work intended for beginners. Most systematists will criticize the inclusion of the fleas with the Diptera. The superfamily Muscoidea is made to include the entire calyptrate and acalyptrate divisions. The superfamily name *Cypseloidea* should be applied to the acalyptrate groups, while *Muscoidea* should be restricted to the higher calyptrates. The Muscoidea of the author are stated to produce ova as a rule, but there are very extensive groups of the higher calyptrates that deposit larvæ; in fact, the larvipositing species of calyptrates will probably easily exceed in number the ovipositing species. The Nematocera has recently been shown by Knab and others to be an unnatural group. In the pages of half-tone reproductions, the Cyclorrhapha are divided into Proboscidea and Eproboscidea, the latter comprising the Pupipara as opposed to all the other Cyclorrhapha; an unnatural arrangement, since the main Pupipara show close affinity with the Cypseloidea and not with the Syrphoidea. The Phoridae are wrongly included in the acalyptrate series. The Bombyliidae, and not the Braulidae, are commonly termed "bee-flies."

With these few friendly criticisms, the book is commended as a very useful means of presenting objective instruction in dipterology.

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SPECIAL ARTICLES

A SIMPLE AND RAPID METHOD OF STUDYING RESPIRATION BY THE DETECTION OF EXCEEDINGLY MINUTE QUANTITIES OF CARBON DIOXIDE

IN order to arrive at a satisfactory knowledge of life-processes, it is necessary to have accurate quantitative methods by which the measurement of these activities can be made. One of the best means of accomplishing this is found in the study of respiration. The production of CO₂ is regarded¹ as the only reli-

¹ Cf. Tashiro, S., *Amer. Jour. of Physiology*, 32: 107.