material within the agar blocks, since there was a marked reduction in recoverable gibberellin-like activity when the agar was left to stand for a period of 28 h following a 12-h diffusion period. Fig. 3 shows the linear relationship between the number of sunflower apical buds diffused and the amount of gibberellin-like substances obtained, expressed in terms of gibberellic acid (GA_3) equivalents. It is likely that the amount of gibberellin diffusing out from an excised organ changes with time even under constant environmental conditions. That this occurs with excised sunflower apical buds is demonstrated in Fig. 4, which contains data obtained in an experiment where the same sample of 50 apical buds was transferred to fresh agar blocks at 12-h intervals. At the end of the first 12-h diffusion period activity equivalent to 0·008 μg GA_3 was obtainable from the agar, whereas at the end of the fourth 12-h period a negligible amount was present. Thus, the initial rate of gibberellin diffusion from the buds into the agar was not maintained. The reason for the decline is obscure; lack of respiratory substrate or of gibberellin precursor are possible factors.

The efficiency of this method for extracting the agar blocks has been evaluated by incorporating known amounts of GA_3 into 1·5 per cent agar blocks of the type used in these experiments, and estimating recovery of GA_3 by means of the dwarf pea epicotyl assay. Earlier experiments were conducted using a technique involving extraction of macerated agar blocks in absolute methanol, but without prior freezing of the agar. When this was done recovery rates of the order of 40 per cent or less were obtained; freezing the water out of the agar blocks before methanol extraction has raised the average recovery to 88 per cent in 30 experiments with a range of 72–100 per cent.

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ENTOMOLOGY

Distribution of Alkaline Phosphatase in the Malpighian Tubules of the Desert Locust

SMALL quantities of alkaline phosphatase have been found in the malpighian tubules of several insect species. Histological investigations suggest that it is not uniformly distributed in the cells of the tubules but that some regions contain the enzyme while others do not[1,2]. This communication summarizes some observations on alkaline phosphatase activity in the malpighian tubules of the desert locust, *Schistocerca gregaria* Forsk, at different stages of development.

Three groups of locusts were chosen to represent immature, mature and aged stages in the life-history of the adult. The alimentary canal of each locust was carefully removed and histological sections were prepared of the malpighian tubules taken from the region of the cæca and posterior mid gut. Alkaline phosphatase was identified by the Gomori–Takamatsu technique[3] and controls stained simultaneously[4]. In each series a minimum of two hundred tubules were examined.

In sections from the region of the cæca there was a positive alkaline phosphatase reaction in 21 per cent of the tubules in immature locusts, 52 per cent in mature locusts and 62 per cent in aged adults. The corresponding values from sections prepared from the mid gut region were 22, 20 and 28 per cent. When present, the phosphatase tended to be localized at the inner border of the cells adjoining the lumen of the tubule, but in a few observations additional concentrations were observed at the base of the cells. Intracellular phosphate was identified in some of the cells which had shown a negative enzyme test.

These observations confirm that small quantities of alkaline phosphatase occur in the malpighian tubules of the desert locust but suggest that it is differently distributed in the proximal and distal portions of the tubules. Such variations may be due to the different functions of the two parts of the tubule[5]. The slight increase in phosphatase concentrations in the older locusts agrees with observations published on the ageing of vertebrate tissues[6], but the wide range of variation between the individuals within this group suggests that further investigations of their immediate physiological state are necessary before comparisons can usefully be made.

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Multimodal Interneurones of Locust Optic Lobe

THE auditory interneurones which ascend the ventral cord of the migratory locust have been traced forward only as far as the neck connectives[1,2]. Fibres which give a similar response can occasionally be found in the lateral parts of the protocerebrum or in the optic lobes by probing with indium-filled platinum-plated microelectrodes. They have not been found, although sought, in the corpora pedunculata. However, by probing in the optic lobe, higher-order neurones which give a different set of responses to auditory stimuli are commonly encountered. These also respond to vibration or touch stimuli of all kinds, to a wide range of visual stimuli via either compound eye, but only to high-intensity stimulation of the ocelli. The most easily found example is in the outer layers of the medulla in the optic lobe. Typically they consist of units which are presumably large because they give large spikes, with a background spike discharge ranging from 1 impulse per 10 sec to 10 per sec. Sensitivities to all modalities are low, compared with other units which respond typically to only one of the modalities. No evidence of association between inputs has been found, although sought. When the stimulus is repeated regularly at intervals of up to 10 sec, the response almost always declines in number of impulses, occasionally down to no response with irregular return of the response to some of the stimuli. The upper limit of repetition frequency varies greatly between units, or between what appear to be the corresponding units in different animals. Also, the rate of decline of the response varies greatly as between units for a standard frequency of stimulus repetition. Responses to different modalities adapt at different rates. Adaptation to a stimulus of one modality does not usually influence the response to a different modality of stimulus newly introduced, demonstrating an independence of inputs, and separate adaptation to each.

The same regional separation of adaptation is always encountered when a stimulus is introduced into a new part of the visual field when a different part of either eye has been adapted out by repetition. Effective stimuli are intensity changes, such as those caused by moving shadows rather than small movements at constant illumination; but the distinction between these types of stimulus is not clear for units with a wide field, within which separate small areas adapt separately. Some units respond at 'on', others at both 'on' and 'off'. These units, therefore, have some properties required of 'novelty units' for visual, as well as for other, stimuli. They have binocular wide-field coverage, and there is evidence, from