previous denervation. In these experiments, too, the responses obtained were quantitatively compared with the direct effect of the normal sympathetic innervation, the suprarenal medullary discharge and further intravenously administered adrenaline and noradrenaline.

In another series of experiments an intense reflex activation of the sympathico-adrenal system was induced by exposing the animals to controlled asphyxia. The motor responses of different effector groups were recorded as previously mentioned, and the role of the direct sympathetic innervation, the suprarenal medullary discharge and the 'overflow mechanism' was quantitatively analysed.

The results obtained allow the following conclusions :

(1) In the cat the upper limit of catechol secretion from the suprarenal glands, induced by stimulating the nerves running to the glands at maximal physiological frequencies, amounted to, roughly, 5 gamma per minute per kgm. of body-weight, when all the cells were concomitantly activated.

(2) The total amount of transmitter substances released at adrenergic nerve endings seems to be relatively small but, owing to the strictly local release in close contact with the effector cells, very high local concentrations are obtained giving effector responses generally ten or even twenty times bigger than those obtained by the suprarenal medullary discharge, when the glands were activated at similar discharge-rates.

(3) Overflow of the transmitter substances produces remote effects that are still smaller, being only about one-twentieth of the effects of the suprarenal medullary discharge and thus indeed negligible when compared with the effects induced by the direct sympathetic innervation. Further, remote effects can be recorded only on sensitized effector cells and then only at such high stimulation-rates that it seems very doubtful whether functionally significant overflow ever will occur in the intact organism.

It seems justified to propose that, as regards the motor function of the smooth muscle effector groups that are controlled by the sympathetic nervous system, these effector cells are quite dominated by their direct sympathetic innervation. Compared with this direct nervous control the motor effects of the suprarenal medullary discharge are quantitatively of minor importance, while the remote effects of transmitter overflow can be practically neglected. It then follows that, when evaluating the function of the suprarenal medulla, the chief stress must be laid upon the metabolic effects of its hormones, such as the mobilization of glucose from the liver and the lactic acid production in skeletal muscles. Such effects are pronounced even at a rather minute discharge from the suprarenal medulla, whereas they are poorly effectuated by the direct sympathetic innervation of the corresponding tissues.

A full account of this work will be published in *Acta Physiol. Scand.*

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Flight Muscle Autolysis and Reproduction in Aphids

Broadbent[1], working with *Myzus persicae* (Sulzer) and *Brevicoryne brassicae* (L.), showed that there was a greater frequency of flights in batches of 1- to 4-day old alatæ than in batches of older aphids. I have now found that flight in these and other species of aphids is not possible after the first few days from the final ecdysis due to autolysis of the flight muscles. After they have lost the ability to fly the aphids may live for as long as 2–3 weeks, producing 1–4 larvæ per day.

Muscle autolysis may be readily observed by clearing the insects in clove oil, and is first detectable by the separation of the sarcostyles. I have observed it in alate alienicolæ of *Aphis fabae* Scop., *Myzus persicae* (Sulzer), *Brevicoryne brassicae* (L.), *Megoura viciae* Buckton, *Macrosiphoniella sanborni* (Gillette), *Acyrthosiphon pisum* (Harris) and *Macrosiphon euphorbiae* (Thomas).

Autolysis of the flight muscles has now been demonstrated in three widely separated groups of insects : ants[2], mosquitoes[3] and aphids, and it may occur also in some beetles[4]. The nitrogen from the breakdown of the flight muscles of ants and mosquitoes is thought to be utilized for egg production ; muscle autolysis in aphids also appears to be associated with reproduction. Alatæ of *Aphis fabae*, whether they have flown or not, lose the ability to fly after the birth of 12–18 larvæ. These may be born within 2–3 days of the final ecdysis ; but when reproduction was delayed by keeping the aphids off the plants for a few days except for short feeding periods, muscle autolysis was correspondingly delayed. Reproduction and muscle autolysis were also delayed by keeping the aphids on plants in complete darkness from the last larval instar.

Alatæ are economically important in infesting plants and spreading viruses for only a few days before flight is prevented by muscle autolysis. The number of plants that can be infested by a single alate aphid of *Aphis fabae* or similar species before it loses the ability to fly will depend upon the number of larvæ it deposits on successive plants. Aphids depositing only a few larvæ on each of the plants they visit may infest several, whereas those which deposit a large number of larvæ on the first plant on which they alight will be able to infest fewer afterwards.

This work is being continued.

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Phase Coloration in Lepidopterous Larvæ

The occurrence of 'phases' in the larvæ of Lepidoptera has been reported by Faure[1] and by Williams and Long[2]. Field observations have shown that in mass outbreaks of *Persectania ewingi*, the New Zealand armyworm, the larvæ were unusually dark, and this suggested the occurrence of phases in the larvæ of this insect.