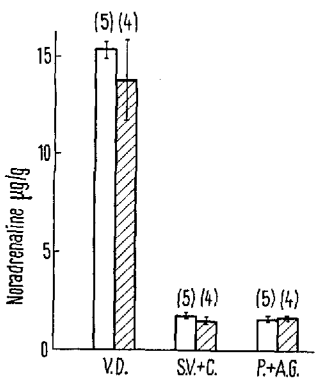
Effect of chronic hypogastric denervation on the noradrenaline content of the vas deferens and the accessory male reproductive glands of the rat

	Number	Body weight g	Weight of pair of vasa deferentia g	Noradrenaline in vas deferens $\mu g/g$ tissue	Weight of pair of seminal vesicles + coagulating glands g	Noradrenaline in seminal vesicles + coagulating gland $\mu g/g$ tissue	Weight of pair of prostate glands + ampullary glands g	Noradrenaline in prostate gland + ampullary gland $\mu g/g$ tissue
Controls mean ± S.E.M.	5	502 ± 9	0.20 ± 0.01	15.4 ± 0.4	0.71 ± 0.06	1.78 ± 0.15	1.28 ± 0.15	1.62 ± 0.17
Denervated mean ± S.E.M.	4	512 ± 18	0.21 ± 0.01	13.8 ± 2.1	0.74 ± 0.08	1.51 ± 0.21	1.27 ± 0.07	1.72 ± 0.05

and secretion. In addition the secretions of the glands, especially that of the seminal vesicles, were more solid than those of the non-denervated rats. The denervation was further checked by electric stimulation in the area, where the hypogastric nerves normally are located. In no case was a contraction of the vas deferens and the reproductive glands seen, in contrast to the controls where an immediate response was obtained on stimulating the hypogastric nerves.

Results. The results are given in the Table and the Figure. As can be seen, no statistically significant reduction in noradrenaline content after chronic hypogastric denervation is observed. There are no significant differences between denervated rats and controls in other respects (body weight and weight of organs) when tested by the student *t*-test.



Effect of chronic hypogastric denervation (9 months) on the noradrenaline contents of the vas deferens, prostate and seminal vesicle of the rat (means ± S.E.M.). White columns controls, shaded columns hypogastric denervated. Number of animals within brackets. V.D., vas deferens; S.V., seminal vesicle; C, coagulating gland; P., prostate; A.G., ampullary gland.

Discussion and conclusion. The present results indicate that not even prolonged denervation and hence inactivation of the short adrenergic neurons innervating the accessory male genital organs reduces the noradrenaline content of these organs. An interesting additional finding was noticed on the vas deferens, when compared with the results previously described[2]. The big rats (500 g) used in this investigation had about twice as much noradrenaline (in $\mu g/g$ tissue wet weight) in their vasa deferentia as the smaller ones used in the previous investigation[2]. The noradrenaline content of the rat vas deferens is thus probably dependent upon the age of the animal as is the case with the brain content[8,9].

Zusammenfassung. Die vorliegenden Ergebnisse zeigen, dass auch langdauernde Dezentralisierung und dadurch bedingte Inaktivierung der kurzen adrenergischen Neurone, welche das Vas deferens und die akzessorischen männlichen Geschlechtsorgane der Ratte innervieren, keine Verminderung des Noradrenalingehaltes dieser Organe verursachen.

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27th April 1967.

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[9] This work has been supported by a grant from Stiftelsen Magnus Bergvalls Minne.

Colour Vision and Colour Preference in the Tropical Eye-Fly

The tropical eye-fly (*Siphonella funicola*. M. family *Chloropidae*) is attracted to the human and animal eye and causes great inconvenience in tropical countries. The phototropic and chromatophilic characteristics of this insect were studied for the first time.

Methods. A glass cylinder 8 inches in length, and 1 inch in diameter, open at both ends and covered by a thin layer of muslin-gauze, with the central 3 inches blackened to render it lightproof, was mounted on a vertical movable axis. Two identical Wild Heerburgg (MTr/3) lamps with diaphragm, electric regulator and arrangement for attaching coloured filters, were arranged with their parallel beams incident on the transparent ends of the cylinder at a distance of 8 inches. About 40–50 eye-flies were transferred to this cylinder for each experiment. The experiments were done in a dark room at a temperature of 26 °C; the coloured filters used were Kodak Wratten filters, Klett–Summerson filters and Coleman filters. Monochromatic colours were projected at one pole of the cylinder, with varying degrees of illumination (as measured with a Standards (British) photometer in foot candles), to determine the chromophilic reactions. In the next set of experiments the colour discrimination and preferences were tested, by projecting 2 different colours with the same intensity, simultaneously, at the 2 ends of the cylinder. After observing which colour they preferred, the filters were interchanged to see whether they would return to the zone of the former preferred colour. This was repeated 3 times.

Results. The results were distinctly uniform, and have been taken from the experiments done with 40 different batches of insects over a period of 8 months. The insects show a high degree of positive phototropism, even towards illuminations as low as 0.1 foot candles (fc)[1]. A striking feature was that, when they preferred a particular colour more than the other, all would swarm en masse, within a second, to the preferred colour zone; which may be referred to as an 'exodus phenomenon'.

All monochromatic lights attracted them when projected individually at one pole of the cylinder. The colour discrimination and preference was the same both at lower intensities of illumination (2 fc) or at higher intensities (100 fc). The order of preference of chromophilia was maximum towards the UV-light (390 nm), the least preferred being red (655 nm), that is it followed the course of the light spectrum (Table I). However, even a dim white light was preferred to the UV-light. The exodus phenomenon of swarming was very marked in discrimination between wave-lengths near the red zone and towards the UV-zones; since the preference between 390 nm and 430 nm, or between 430 nm and 470 nm, was only about 60–70%, some insects still remaining on the other side.

Tables I and II. The preference of colours (expressed as nm)

I

100 fc	100 fc	100 fc	100 fc	100 fc	100 fc
655 → +++ →	590	590 → +++ →	525	470 → ++ →	430
655 → +++ →	540	590 → +++ →	470	470 → ++ →	390
655 → +++ →	525	590 → +++ →	430	430 → ++ →	390
655 → +++ →	500	590 → +++ →	400	665 → + →	660
655 → +++ →	470	590 → +++ →	390	540 → + →	500
655 → +++ →	430	525 → ++ →	470	540 → + →	525
655 → +++ →	390	525 → ++ →	430		
590 → +++ →	540	525 → ++ →	390		

II

100 fc	500 fc	2 fc	12 fc
660 → +++ →	420	660 → +++ →	590
420 ← +++ ←	660	590 ← + ←	660
660 → +++ →	540	660 → +++ →	540
540 ← +++ ←	660	540 ← + ←	660
590 → +++ →	525	590 → +++ →	540
525 ← +++ ←	590	540 ← + ←	590
660 → +++ →	590	660 → +++ →	390
590 ← +++ ←	660	390 ← + ←	660
660 → +++ →	390	660 → +++ →	470
390 ← +++ ←	660	470 ← + ←	660
		540 → +++ →	470
		470 ← + ←	540

+++, 100% migration within 1 sec; ++, approximatively 60–70% migration; +, approximatively 50% migration; →, direction of swarming to the preferred colour.

In the third set of experiments, the reactions were tested with unequal illumination: at higher levels (between 100 fc and 500 fc), the same pattern as above occurred, but at lower levels (2 fc and 12 fc) a brighter green was preferred to a red and a brighter blue to yellow, but between a brighter red and a dim green, the response towards the dim green was only about 60%, and so on between a brighter yellow (12 fc) and a dim blue (2 fc) (see Table I).

Discussion. The presence of positive phototropism in the tropical eye-fly, which is a very small insect measuring on an average 1.6 mm × 0.45 mm, and the capacity to discriminate between intensities with a difference of 1–2 fc at lower levels and 100–120 fc at higher levels has been shown[1], while in the bees most of them stop flying below 100 U of illumination[2].

Colour vision and colour discrimination capacities have been studied mainly in the bees and wasps[3], especially in distinguishing yellow on a green background. The above experiments show the presence of colour vision and capacity for discrimination-preference, for colours of transmission as against, the colours of absorption as tested in the bees[3].

The preference-discrimination capacity is better towards the red end of the spectrum than the violet, where some of the insects were unable to distinguish between 390 nm and 430 nm, and it is similar to that seen in other insects, where the spectral sensitivity is limited to the red, though extending towards the UV-light, thus differing from the vertebrate eyes[4].

Though the affinity for UV-light, especially for nocturnal insects, is well known, here they preferred even a weak white light to the latter. Only 2 main receptors have been shown to be present in the housefly, a 'long wave' red receptor sensitive to 620 nm and a short wave green receptor, sensitive between 490 to 365 nm[5], with only a monochromatic (green) vision during twilight[5], while here the insects were sensitive to all spectral colours, with colour discrimination even under scotopic vision. This capacity to discriminate at low levels of illumination, that is under scotopic vision is interesting since these insects are strictly diurnal, and do not normally fly at night. Their attraction towards the eye appears to be due to the shine of the reflected light in the eye[6].

Zusammenfassung. Farbsehn- und Unterscheidungsvermögen tropischer Fliegen wurde erstmals untersucht: Es kann zwischen verschieden monochromatischen Farben unterschieden werden, überdies haben sie eine deutliche Bevorzugung für Farben des Lichtspektrums, zunehmend gegen das UV-Licht.

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6 Acknowledgments: we are grateful to Prof. T. V. SUBRAMANIAM, retired Director of Entomology, Mysore, for the entomological identity of the tropical eye-fly.