the Krebs-reserpine perfusion had lasted, the less complete was the recovery from depression.

Uterine stimulants were added to the organ bath in a random order and left for 5 min while the integrated tension was measured. They were then washed out for 5 or 10 min until uterine tone relaxed to the baseline. In each experiment, one dose was added during perfusion with the control solution and then repeated during Krebs-reserpine perfusion. Submaximal concentrations were used which, allowing for variations in sensitivity, caused comparable degrees of integrated tension when added during the control perfusion. In Table II the increase in the activity of the electrically stimulated uterus in response to these drugs is shown. The mean results obtained using uterine horns from guinea-pigs pre-treated with reserpine and saline are compared, and as will be seen, they followed a similar pattern in both groups of experiments. Depression during perfusion with Krebs-reserpine solution was only partly reversed by the drugs, the responses to the drugs being significantly less than those obtained during control perfusion. Proportionately, the uterine responses to procainamide, ouabain and calcium chloride were inhibited by reserpine-induced depression much more than those to oxytocin and acetylcholine.

Table II. Increase in the activity of the electrically stimulated uterus in response to drugs added to the organ bath during perfusion with control and Krebs-reserpine solutions. Guinea-pigs were pretreated with (a) reserpine or (b) saline. Integrated tension is given in g sec ± S.E. Each result is the mean of 7 experiments. $^a = p < 0.02$, $^b = p < 0.01$, $^c = p < 0.001$

Drug concentrations	(a) Reserpine pre-treatment		(b) Saline pre-treatment	
	Control solution	Krebs-reserpine solution	Control solution	Krebs-reserpine solution
Acetylcholine 100 ng/ml	6645 ± 875	2396 ± 415^c	7493 ± 896	2216 ± 322^c
Oxytocin 25 ng/ml	4825 ± 555	1431 ± 255^c	6171 ± 580	2361 ± 262^c
Procainamide 200 µg/ml	4271 ± 939	644 ± 212^b	4151 ± 483	209 ± 91^c
Calcium chlor. 100 µg/ml	4459 ± 975	519 ± 175^b	5241 ± 657	654 ± 246^c
Ouabain 0.5 µg/ml	3359 ± 1117	304 ± 178^a	3747 ± 270	364 ± 124^c

The depressant effect of reserpine observed in these experiments was complementary to the finding of GUPTA and KAHALI[6] that crude rauwolfia depressed the guinea-pig uterus *in vivo* and *in vitro*, and to the observation that reserpine antagonized the action of 5-hydroxytryptamine on the isolated rat uterus[7].

NAYLER[2] found that reserpine caused an efflux of calcium from the electrically stimulated toad heart, and suggested that the reversal of reserpine-induced depression might be due to an effect on membrane calcium. Since calcium is essential for smooth muscle contraction[8], this might also be true of the uterus. But if so, the results of these experiments indicate that acetylcholine and oxytocin have a much greater effect on membrane calcium than procainamide, ouabain or an increase in extracellular calcium[9].

Zusammenfassung. Reserpin verhindert sofort die elektrische Reizbarkeit des isolierten Meerschweinchenuterus. Eine Depression wurde von einigen Substanzen nur partiell bewirkt, wobei sich auffallende Wirkungsunterschiede zeigten.

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Elicitation of Strikes of Predatory Insects by Projected Images and Light Spots

Praying mantids [*Hierodula* (*Rhombodera*) *crassa*] catch their prey with a very quick movement of their forelegs (extension in 48–75 msec[1]). Dragonfly larvae (*Aeschna cyanea*) strike at their underwater prey with a somewhat slower movement of their extensible labium. The characteristics of the prey which release both the mantis and the dragonfly larva strikes and the feeding behavior of these insects have been previously studied[2–7].

In an effort to develop a method for studying the effective strike releasing parameters more quantitatively we have investigated the reactions of these insects to projected two-dimensional images. The animal is placed in a cage or aquarium, one wall of which is made of a translucent diffusing screen (milk glass or tracing paper), and the images under study are projected through a lens onto this wall. The projection of the image of a live insect allows one to quantitatively vary its size and sharpness, while at the same time retaining the normal movements of the prey. Mantids will readily strike at the projected two-dimensional image of a live moving fly several times enlarged, or even at a severely defocused image of a live fly.

A further simplification of the stimulus is to project only a moving spot. An oscilloscope trace provides an ideal image for such experiments as it may be moved in an

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easily controllable manner. Both mantis and dragonfly larva[8] will strike at the image of a moving light spot. With simple linear or sinusoidal motions, however, it is much easier to elicit the strike of a dragonfly larva than of a mantis.

Figures 1 and 2 show the response of dragonfly larvae to the systematic variation of a single parameter of movement. Comparison of the two graphs shows that the additional movement of the spot in the vertical direction enhances the strike releasing value of the image.

A still further reduction of the releasing image may be accomplished by shielding all but two small spots of the oscilloscope screen and letting the trace of the oscilloscope illuminate the spots consecutively. Figure 3 shows a pair of luminous points at which the dragonfly larva struck. The strike was recorded by placing the insect on a perch attached to a phonograph needle and displaying the amplified impulse from the phonograph cartridge on the oscilloscope. In a series of four experiments three different animals were presented with pairs of spots at irregular intervals (mean interval between pairs = 1 sec). The interval between spots of a pair was either 50 or 100 msec. As measured from the second spot of the pair the mean reaction time of the four experiments was 251 ± 10.8 msec (standard deviation = ± 68.5 msec). This reaction time was short enough to allow us to determine which stimulus pair released the strike. That the phonograph cartridge actually records the onset of the strike and not the contact of the labium with the projection screen was verified by letting the animal strike at a pair of fine contacts and recording on a two-channel tape recorder the time interval between the pulse from the phonograph cartridge and the closure of the contacts. This method, similar to one used by ROEDER[1] to record the duration of mantis strikes, gave an average value of 470 ± 56 msec for the strike duration. (The relatively large error of the mean is probably due to the variable distance of the insect from the contacts.)

The results reported here indicate that, as with mantis, motion plays the major role in the release of predatory strikes of dragonfly larvae. On the other hand the stimulus may lack any real figurative component and still release strikes[3], as in the case of the sequence of two light spots. In these respects the value of the presented method is to allow a quantitative and independent variation of several stimulus parameters (and thus the systematic reduction of its complexity) and in addition an easy control of its movement.

Further studies on the motion perception of dragonfly larvae and the releasing characteristics of projected images are in progress.

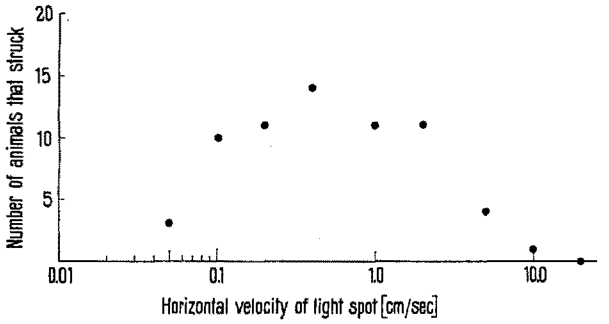

Fig. 1. Response to an oscilloscope trace moving horizontally across the screen at various velocities. The number of animals that struck is plotted as a function of the horizontal velocity of the light spot. Each point represents an independent trial of 20 animals.

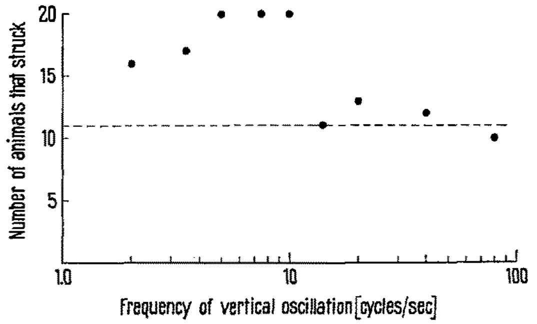

Fig. 2. Response to an oscilloscope trace moving horizontally across the screen while oscillating vertically with various frequencies. The number of animals that struck is plotted as a function of the oscillations per unit-time. Each point represents an independent trial of 20 animals. [The horizontal velocity (1 cm/sec) of the sweep and the amplitude (0.4 cm) of the oscillations were kept constant.]

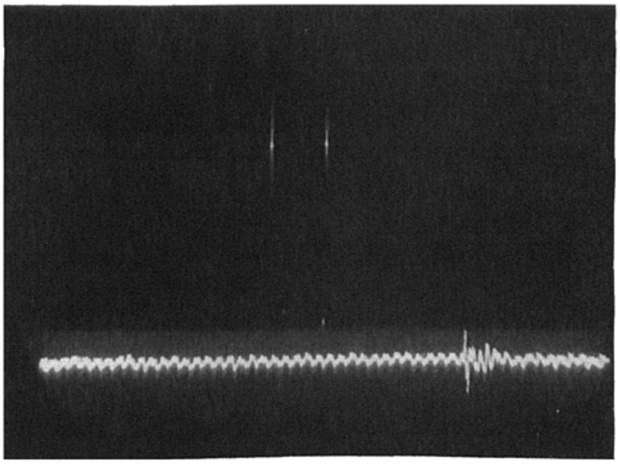

Fig. 3. Response to a sequence of two light spots. Two light spots of 3.0 msec duration have been generated by the upper trace of an oscilloscope; the interval between them is 100 msec and they fall 0.5 mm apart from each other on the projection screen. Only these spots were visible to the animal. – The resultant strike of the insect was recorded on the lower trace, which shows a waveform of 50 cycle hum. Strike occurred 257 msec after presentation of the second spot.

Résumé. Les larves de Libellules lancent leur masque sur l'image projetée de proies vivantes, sur un point lumineux mobile engendré sur un oscilloscope et sur deux points statiques qui s'illuminent successivement. Les méthodes permettent de varier systématiquement les caractères du «stimulus déclencheur» et de mesurer le temps de réaction et la durée de la projection du masque.

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