their appearance was in no way different from that before treatment.

The changes we found in the mitochondria of the treated animals were gross and, as far as we are aware, have not been described previously. Zaimis (*5*) described chronic inflammatory cell infiltration and focal necrosis in the heart after long-term administration of reserpine; these changes were acute after large doses (1 mg/kg). These seem to be additional and possibly unconnected changes probably caused by the larger amounts of reserpine used. In our study changes were confined to the mitochondria, and the muscle appeared normal by light microscopy.

Schwartz and Lee (*2*) found approximately 25 percent uncoupling of oxidative phosphorylation in heart mitochondria of cats and guinea pigs 24 hours after treatment with 5 mg of reserpine per kilogram body weight. In our study the dose of reserpine used per unit weight was not greatly in excess of that which may be used clinically.

It seems likely that depression of myocardial function would accompany the changes we have described. Such depression has been found by some investigators (*6*) but not by others (*7*). It also seems possible that the depletion of catecholamines caused by reserpine might be due, at least in part, to an action of the drug on the mitochondria of sympathetic nerves. It is known that noradrenaline is formed in the nerve cell body and then transported down to the nerve terminals (*8*). However, we were unable to identify any nerve tissue in our sections, and it is therefore not possible to say whether the mitochondria of the adrenergic nerves supplying the myocardium were similarly affected.

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Role Differentiation in Copulating Cicada Killer Wasps

Abstract. *Copulating male and female cicada killer wasps have distinct behavioral roles independent of reproduction. Males terminate copulation, and females initiate the copulatory flight in which the pair in copulation escape potential danger. Separation and escape behavior are mutually exclusive. Separation occurs because the female clings to the substrate and fails to join the male in his frequent attempts at flight; thus he eventually pulls free. Escape occurs when the female begins flight, which the male readily joins. Differences in thresholds for flight probably largely determine both roles. There appears to be an evolutionary balance in escape and separation behavior determined by the behavior of the female, and illustrative of behavioral homeostasis. The female remains still in the presence of mild stimuli, such as attempted male flights, and thereby aids in separation; she initiates escape in the presence of strong stimuli such as potential enemies.*

A 10-year field study (1956 to 1966) of cicada killer wasps *Sphecius speciosus* was conducted in New York. Seventy-nine copulating pairs were observed (*1*). The male mounts the female in a manner similar to that described for the copulation of other sphecid wasps such as *Bembix* (*2*), *Ammophila* (*3*), *Mellinus* (*4*), *Oxybelus* (*5*), *Stictia* (*6*), or *Tachyspex* (*7*), but upon insertion of the genitalia he immediately dismounts and faces in the opposite direction, thereby assuming a linear position (*8*, *9*). Copulation is lengthy; six copulations seen in entirety ranged from 29 to 51 minutes, with a mean of 37 minutes. Separation of the pairs was observed 13 times, and the male broke the connection by attempted flight with one possible exception (Fig. 1). The possible exception involved attempted flights by the male, but in the actual separation the male may have withdrawn without flight. Such "spontaneously" occurring attempts at flight by the male (separation behavior) begin early in copulation, even seconds after insertion of the genitalia. Consequently most of the copulation period involves or is primarily devoted to disengaging behavior.

In the cicada killer, genitalia that are difficult to disconnect are hypothesized to have evolved as a consequence of selection for genitalia that are never dislodged by the frequent pouncings of conspecific males on couples (*9*). Frequent interference occurs because cicada killers are highly gregarious; colonies may exceed 900 individuals (*9*, *10*). Lengthy copulation, however, probably occurs because the couple has difficulty in disconnecting, an apparently "undesirable" consequence of conflicting selection pressures in the aforementioned evolution. Lengthy copulation and difficulty in separation probably influenced the evolution of special roles of copulating males and females. Males, being smaller and weaker, were probably preadapted to the separator role, using the heavier counterweight of the females to pull against. The larger females were probably preadapted to the escaper role because of their greater strength which enables them to pull males behind them in the copulatory flight in the event of danger. The actively flying male supports its own weight in flight but does not appear to fly backward. The copulatory flight is usually elicited by movement or tactile interference of conspecific males or humans. It probably evolved as an escape mechanism used during the long and vulnerable copulation period (*9*).

The copulatory flight occurred in all 24 cases in which the female was observed to attempt flight, but there were no separations. Flight attempts by males were considerably more common; however, in 69 recorded attempts, females never joined the males but clung to the substrate, apparently resisting their pull. There were 13 separations. When females began flight, males appeared to "cooperate" fully. They did not cling to the substrate or

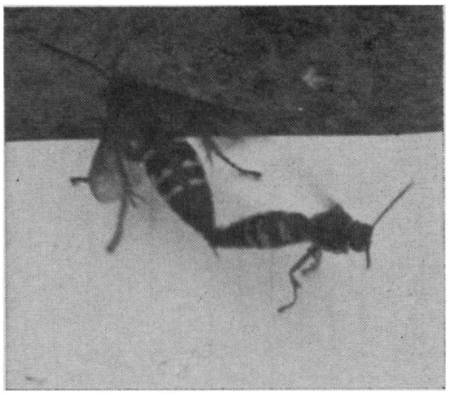

Fig. 1. A copulating pair of cicada killers. The smaller male has begun flight while the female behaves as is typical in this situation by continuing to hold or cling to the substrate. The result is usually an aborted flight attempt by the male or ultimately the breaking away and termination of the copulation by the male.

resist the females, but immediately began flight. Escape was thus facilitated by this behavior.

Females apparently can communicate the presence of potential danger to males and elicit flight in them. However, the information is not precise, because the males' response is the same when females begin flight "spontaneously." Males are unable to, or at least do not, distinguish flight elicited by potential enemies from flight elicited "spontaneously" in the female. Thus the major differences in the two roles appear to be largely dependent on the differences in threshold for flight behavior. Communication is also unidirectional (that is, from female to male).

Other adaptations seem associated with these two necessarily exclusive roles. Separation may be enhanced by the male's considerably more frequent attempts at flight and, when the substrate permits, the male's frequent tendency to dangle free in space. On vertical surfaces, the male is almost always lower than the female, consequently gravity may facilitate separation. One apparent adaptation aiding in raising the female's threshold toward flight is a strong tendency toward cleaning behavior which apparently is much aggravated after repeated approach and contact stimulation by the observer. This behavior seems to inhibit flight.

There appear to be several "undesirable" consequences of conflicting selection pressures. The males have a greater ability to perceive or respond to danger, as indicated by attempted flight, without being able to communicate the presence of danger to the female, and there is an understandable incongruity of the female's escaper role and her considerably higher threshold for flight in response to danger. Both of the above appear to be indirect consequences of the female's remaining still when the male attempts flight, thereby fostering or perhaps even making possible the eventual separation of the couple. Thus the female's considerably higher threshold for either "spontaneously" or nonspontaneously induced flight aids in separation. The dilemma arising from these conflicting selection pressures appears to have been satisfactorily resolved by behavioral evolution of the female. A balance appears to exist between the two conflicting behaviors (separation and escape). The female's generally lowered responsiveness to mild stimuli enables her to act as a counterweight against attempted flights of the male thereby facilitating separation, while her tendency to respond to strong stimuli by flight enables the pair to escape potential enemies. Centripetal selection probably opposes much oscillation in shifting the mean in favor of either behavior since the efficiency of the opposing behavior would be greatly curtailed. This balance illustrates behavioral homeostasis at the level of the copulating pair. The balance, however, is probably dynamic; and under changing conditions, such as in the importance of enemies, directed selection may be expected to shift the mean in favor of one or the other behavior.

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Recovery of Masked Visual Targets by Inhibition of the Masking Stimulus

Abstract. *Theories of visual backward masking all assume that a masked target is eliminated from the visual system. Experiments on reaction time to masked signals suggest otherwise, as does a recent demonstration that a masked target can be restored to phenomenal awareness by backward masking of the target's mask. Two experiments are reported here that substantiate the possibility of recovering a masked target, by using different stimulus materials and a more elaborate design than was employed in the first demonstration of this effect.*

Visual backward masking consists in the retroactive interference with the perception of one visual stimulus, the target, by another visual stimulus, the mask, closely following the target in time. The primary issue for theories of backward masking has been to explain why such a masked target is not perceived. Hence, theoretical efforts (*1*) have been devoted to postulating mechanisms whereby the target might be removed from the visual system. However, some experiments (*2*) have shown that reaction times to masked targets are not increased, even though reaction time is ordinarily inversely related to target luminance. This finding indicates that masked targets retain some representation in the visual system despite their phenomenal absence.

The present research follows another approach to assessing the status of a masked target. It bears close resemblance to a recently reported experiment by Robinson (*3*), who concluded that a masked target could be recovered if its mask were itself suppressed through backward masking. In that experiment the target was an illuminated disk; mask No. 1 was a larger disk, and mask No. 2 was a still larger disk. Subjects indicated via phenomenal report what they saw when the target was followed only by mask 1 and also when the target was followed by mask 1 and mask 2 in sequence. The latter condition yielded more reports of the target than the former.

One weakness in the Robinson experiment is the failure to present data on a possible direct effect of mask 2 on the target. It most likely would be inhibiting, if at all effective, but it con-