

Remodeling the Insect Central Nervous System

As in anuran metamorphosis, insect metamorphosis causes a major restructuring of the organism's nervous system. Some nerves die, while other nerves take over new functions. Earlier in Chapter 23, we saw the development of the *Drosophila* photoreceptors from the epithelial cells of the eye disc. Here, a new set of neurons is generated to take on a new function. The neurons that have been connected to dying tissues either die with the tissue or are respecified for new functions. The nerve that innervates the proleg muscle of the caterpillar of the *Manduca* moth is independently sensitive to ecdysone and perishes simultaneously with its larval target tissue. However, the motor neuron innervating the second oblique muscle of the larva survives the death of its target to innervate a newly formed adult muscle (the fourth dorsal external muscle) that differentiates during metamorphosis (Truman et al., 1985).

In some instances, larval functions are taken over by different regions in the adult. The larval firefly has its paired lanterns in the eighth (last) abdominal segment. The neurons from the eighth abdominal segment control its luminescence. During pupation, the sixth and seventh segments also develop the light-producing photocytes and the nerves to control the timing of the flash. By the end of pupation, only the sixth and seventh segments have functional lanterns. Moreover, if the larval lanterns are removed, the adult lanterns will still form (Strause et al., 1979). Thus, what had been a neural function of the eighth segment ganglia has become a function of the ganglia of the sixth and seventh segments.

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