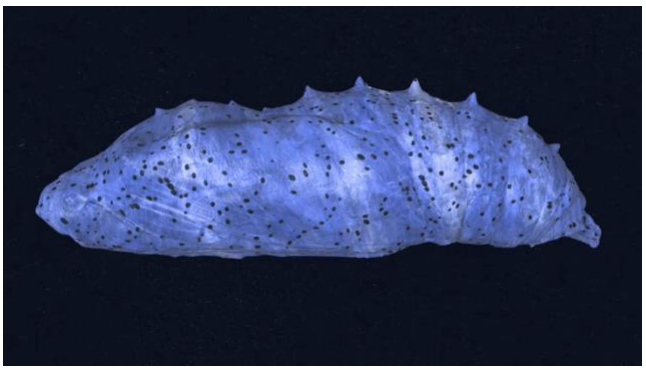
WHY INSECT MEMORIES MAY NOT SURVIVE METAMORPHOSIS

GREGORIO, MAIN CHARACTER OF METAMORPHOSIS BY KAFKA

Gregorio awakes one day as a monstrous insect; adult insects likely can't remember much of their larval life. Although many of the larval neurons in the study endured, the part of the insect brain that Truman's group examined was dramatically rewired.


METAMORPHOSIS

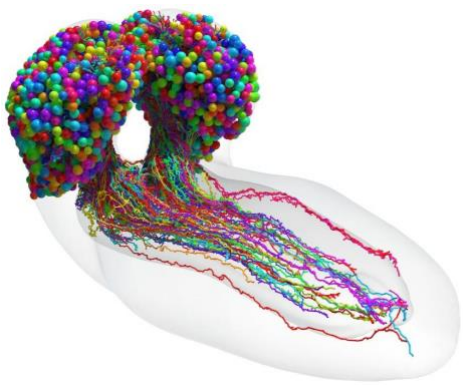
When?

The earliest insects 480 million years ago emerged from eggs looking much like smaller versions of their adult selves, just as grasshoppers, crickets and some other insects do today. Metamorphosis in insects ± 350 million years ago, before the dinosaurs.

Why?

Metamorphosis evolved to lessen the competition for resources between adults and their offspring: Larvae eat very different foods than the adults did. "It was a great strategy"

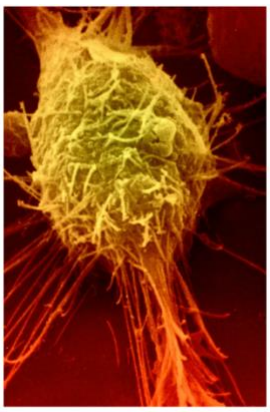
Who?



Metamorphosis is not an exception in the animal kingdom; it's almost a rule. More than 80% of the known animal species today, undergo some form of metamorphosis or have multistage life cycles.

METAMORPHOSIS AND BRAIN

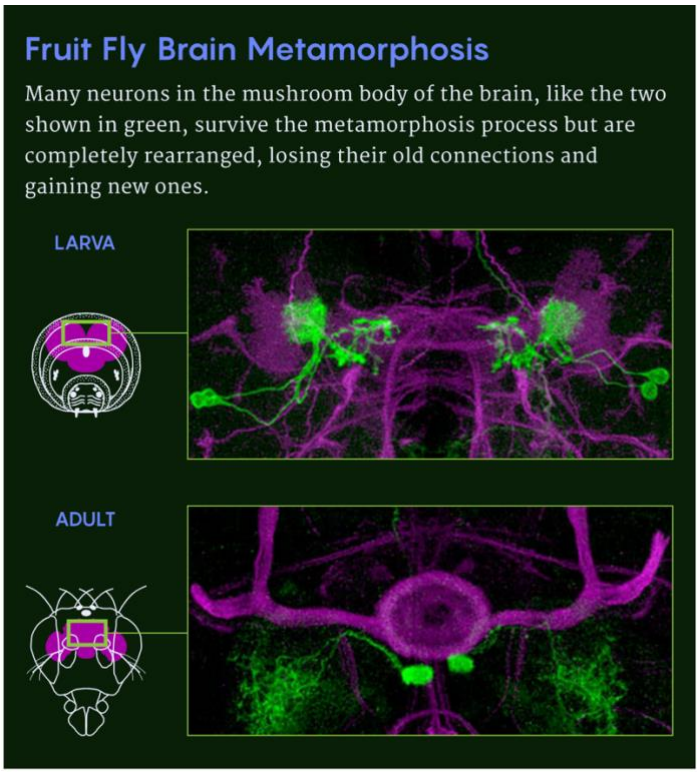
During metamorphosis, as the larval cells begin to die or rearrange themselves, the body of the insect inside its cocoon or exoskeletal casing turns into something like a soup, with all the remaining cells fluidly sliding around together. But that's not quite right, Truman explained. "Everything has a position



Stem cells called neuroblasts mature into the neurons that make up the insect nervous system.

THE STUDY: HOW?

1. Trace individual cells and circuits through the process.
2. "The nervous system has never been able to change the way it makes neurons," = neuroblasts mature into neurons. That process is older than metamorphosis itself: most of the original neurons are recycled.
3. Map the brain changes in that gelatinous mass: genetically engineered fruit fly larvae that had specific neurons that shone a fluorescent + praticlar drug= turn on a red fluorescence in the neurons



1. Mushroom body: a region of the brain critical for learning and memory.

2. Only 7/10 of the neural compartments are incorporated into the adult mushroom body. Of this 7, some neurons die or are remodeled to perform new adult functions. All the connections between the neurons are dissolved

3. The 3 larval compartments that don't get incorporated = shed their old identities

4. Relocating neurons are only temporary guests in the larval, taking on necessary functions for a while but then returning to their ancestral tasks in the adult brain

5. Many new neurons are born as the larva grows and they are not used by the larva, but at metamorphosis they mature to become input and output neurons for 9 new computational compartments that are adult specific.

The mushroom body in the larva looks very similar to the adult version, but "the rewiring is really intense."

CONCLUSION: METAMORPHOSIS AND MEMORY

Associative memories can't survive may not be hold true for all species.

Yet, many species of insects show a preference for reproducing on the same types of plants where they matured: Larvae born and raised on apple trees later tend to lay eggs on apple trees as adults.