

Beetle Breath

Insects are incredibly important ecologically, agriculturally and medically, but we still understand little about their basic physiology, hampering our ability to protect beneficial insects and control harmful ones. Unlike mammals, insects transport oxygen and carbon dioxide to their tissues through air-filled tubes (called tracheae). We used to think that these tubes were rigid and that, in most insects, gases were transferred completely by diffusion. Recent synchrotron x-ray videos have demonstrated that in most insects many of these tracheae collapse rhythmically, pumping air by convection through the system. Some data suggests that the pressures are generated by compressions of abdominal muscles that drive the gut like a piston forward toward the head. This National Science Foundation-funded project uses giant mealworm beetles and aims to understand what is generating the pressures that collapse tracheae, how the air flows through the system, and how important these pressure pulses are for blood circulation. Students will learn how to care for beetles, conduct flow-through respirometry experiments, and analyze data. Experimental protocols may also include measurements of ventilation and radio-isotopic measures of blood flow and mixing. Students are expected to work at least ten hours per week in collaboration with Ph.D. student Trevor Fox, and may earn course credit. Contact Trevor at tpfox1@asu.edu for more information.

