

Honey Bee Pollen Packing Mechanics

Commercial agriculture is increasingly more dependent on pollination services to such an extent that the number of honey bee colonies available for crop pollination cannot meet global demand. Honey bees are the world's most valuable pollinator and are responsible for pollinating 90 different agricultural crops in the US alone. As our modern food systems become increasingly more dependent on insect pollination, it is imperative we explore exactly how pollination processes occur at both a biological and a locomotive level. *Apis mellifera* worker bees carry their pollen loads externally in complex structures known as corbiculae, or "pollen baskets" located on the tibia of their posterior legs. This external pollen-carrying adaptation and the intricate mechanical processes involved in its use are relatively unexplored. Others have artistically documented this process in drawings but, as to our knowledge, no one has yet captured pollen packing and its deposition within the colony on film with sufficient clarity for computer analysis. We have gathered high quality footage of pollen deposition within the colony, and we will use this footage to analyze the mechanics of how the pollen pellet is removed inside the hive. If we can begin to understand the intricate mechanics involved in the collection and subsequent deposition of pollen, it will open new pathways in the realms of engineering alternatives and artificial pollination. It is important to look to the natural world for inspiration for new engineering models and honey bees' impact as pollinators are integral in that process.

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