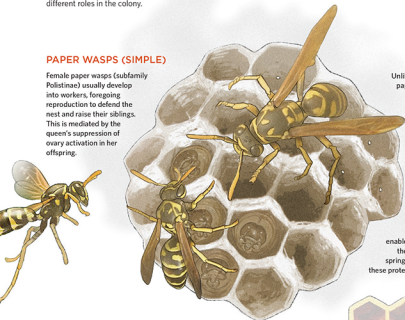


## SOCIETY LIFE

Eusociality has evolved multiple times in the history of life. But not all eusocial societies are the same. They range from simple, with castes differentiated by behavior only, to complex, with phenotypically diverse queens and workers, and sometimes multiple worker castes that play different roles in the colony.

### PAPER WASPS (SIMPLE)

Female paper wasps (subfamily Polistinae) usually develop into workers, foraging, reproduction to defend the nest and raise their siblings. This is mediated by the queen's suppression of ovarian activation in her offspring.



Unlike other eusocial species with fixed castes, paper wasp workers can switch to be a queen if the opportunity arises to found a new nest or supersede the current queen (her mother) in her own nest. Future queens show higher expression of several genes involved in caste determination in other eusocial insects that have more visible distinctions between castes.

In temperate species, larvae that develop toward the end of the summer have high levels of a group of proteins that enable them to survive the winter and reproduce the next year, while larvae that develop in the spring or early summer have low levels of these proteins and usually remain workers throughout their lives.

### HONEYBEES (COMPLEX)

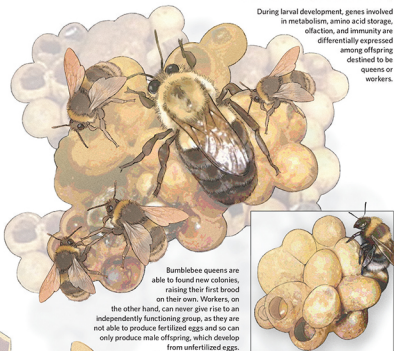
Honeybee queens arise from larvae fed royal jelly, a complex compound that contains a histone-regulating protein thought to be responsible for triggering the switch to queen development.



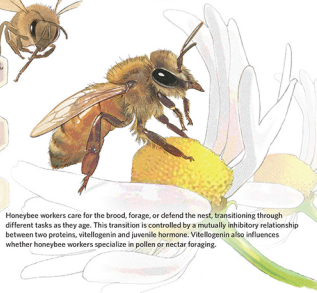
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### BUMBLEBEES (INTERMEDIATE)

During larval development, genes involved in metabolism, amino acid storage, olfaction, and immunity are differentially expressed among offspring destined to be queens or workers.



Bumblebee queens are able to found new colonies, raising their first brood on their own. Workers, on the other hand, can never give rise to an independently functioning group, as they are not able to produce fertilized eggs and so can only produce male offspring, which develop from unfertilized eggs.



Honeybee workers care for the brood, forage, or defend the nest, transitioning through different tasks as they age. This transition is controlled by a mutually inhibitory relationship between two proteins, vitellogenin and juvenile hormone. Vitellogenin also influences whether honeybee workers specialize in pollen or nectar foraging.