

## Lecture 9: Hymenoptera



*Spalangia nigroaenea*, a parasite in the family Pteromalidae, depositing an egg into a house fly puparium. Photo by David Voegtlin.

Hymenoptera: Including the sawflies, parasitic wasps, ants, wasps, and bees

2 versions of derivation of the name Hymenoptera:

Hymen = membrane; ptera = wings; membranous wings

Hymeno = god of marriage -- union of front and hind wings by hamuli

Web sites to check:

[The order Hymenoptera](#) (at The Wonderful World of Insects)

[Hymenoptera at the Tree of Life](#)

Description and identification:

Adult:

Mouthparts: chewing or chewing/lapping

Tarsal segments: 5

Size: Minute to large

Wings: 4 or none, front wing larger than hind wing, front and hind wings are coupled by hamuli to function as one<

Antennae: Long and filiform in Symphyta; many forms in Apocrita

Other characteristics: Abdomen is broadly joined to the thorax in Symphyta; constricted to form a "waist"-like propodeum in Apocrita.

Immatures:

In Symphyta, eruciform (caterpillar-like), but with 6 or more pairs of prolegs **that lack crochets**; 2 large stemmata; all are plant-feeders

In Apocrita, larvae have true head capsules, but no legs; many feed on other arthropods

Metamorphosis: Complete

Similar orders:

Adults: Diptera (but the flies have only 2 wings plus two halteres)

Immatures: Symphyta resemble Lepidoptera, but have more abdominal prolegs, and the prolegs lack crochets. Eye structures also differ. Apocrita may resemble grubs or maggots, but with head capsules, and their habitat usually differs.

Habitat: On vegetation, as parasites of other insects, in social colonies

Pest or Beneficial Status: A few plant pests (sawflies); beneficial because of many parasitic species, pollination, and honey production. Stinging can injure humans and domestic animals.

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**Symphyta** (one of two suborders): The sawflies and horntails.

Ovipositor is sawlike

Broad "waist" at junction of thorax and abdomen

Larvae resemble caterpillars but have 1 pair of large ocelli and 6 or more pairs of prolegs without crochets

Examples: [conifer sawflies \(Diprionidae\)](#) (Genera = Diprion and Neodiprion); [wheat stem sawflies \(Cephididae\)](#); and [horntails \(Siricidae\)](#).

The conifer sawflies can occur in large enough numbers to be serious pests (especially because most conifers do not survive heavy defoliation). The wheat stem sawfly has been (and again is) a serious pest of wheat in the northern plains and Canada -- control is by resistant varieties and such cultural practices as tillage and crop rotation.

**Apocrita** (the second and more advanced suborder of Hymenoptera):

Narrow waist

Larvae more grub- or maggot-like, with true head capsule

Parasitic species deposit their eggs inside another insect, and the larva(e) develop within that "host," killing it only after the parasites are nearly mature. Many parasitic Hymenoptera have been introduced to North America for biological control.



A parasitic wasp (family Aphelinidae) has developed within this aphid, killed it, and emerged from it.

Families of parasitic Hymenoptera include (among several) ...

**Braconidae**: Includes many important parasites in the genera *Apanteles*, *Cotesia*, and *Macrocentrus*

**Ichneumonidae**: Includes the imported parasites in the genus *Bathyplectes* that attack the alfalfa weevil. Also some species with very long ovipositors used to reach the eggs of host insects that are boring in the wood of trees or deep within other plant tissues.



*Bathyplectes curculionis*

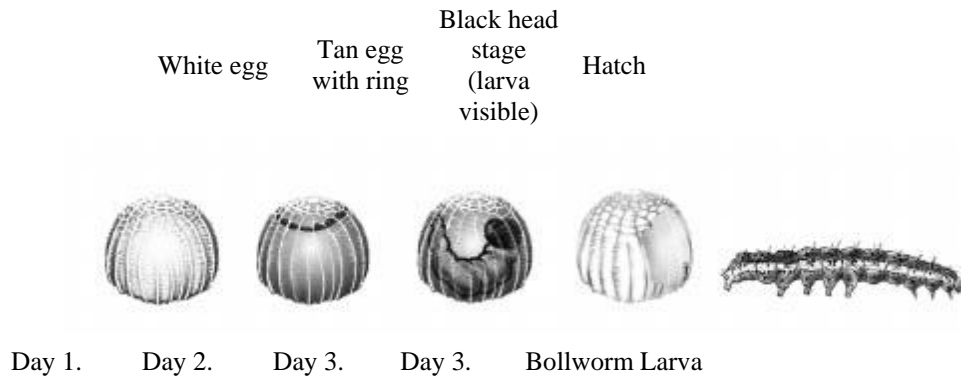
**Aphelinidae**: Includes many parasites of aphids and other Homopterans.



*Encarsia formosa*, a parasite of whiteflies

**Trichogrammatidae**: Egg parasites. The genus *Trichogramma* is best known.

Trichogramma life cycle.



Development of Trichogramma Wasp



Other major nonparasitic families within the Apocrita include:

**Cynipidae**: The gall wasps, especially common on oak. (See [Gall-making Insects](#) by John Byers, and do an image search on Google, using the key word Cynipidae.)

**Formicidae**: The ants.

All are social

Winged and wingless forms

Antennae elbowed

3 castes .. Queens, workers, males (die off after mating)

Ants are among the most numerous creatures on the face of the earth. Among the most well known are the imported fire ant, *Solenopsis invicta*, and the carpenter ant, *Camponotus* spp. Fire ants inflict a painful sting, and because they form huge nests (>100,000 individuals), they pose a real danger to livestock and humans. Carpenter ants nest in wood, but do not eat it. They almost always are found in

damp and partially rotted wood. Their control is usually best achieved by replacing the damaged wood and repairing the leak or other problem that caused the wood to be damp. Most ants are not pests!!!



A carpenter ant

**Vespidae:** Vespid wasps ... paper wasps, yellow jackets, hornets. Queens overwinter and establish new nests annually; others die off. Most nest in the ground; the bald-faced hornet makes large paper nests in trees. They are scavengers and predators, not pollinators; unlike the bees, they do not have body hairs or specialized structures for gathering and carrying pollen. Distinguishing these insects from wasps in the family Sphecidae will be covered in the lab; and even a few other wasp families are somewhat similar.



A yellow jacket

**Apidae:** The bumble bees and honeybees. (There are several other families of bees also.)



The honey bee, *Apis mellifera mellifera*

The honey bee is an introduced species. Wild populations of the honey bee are at very low levels because of parasitism by two mites, the tracheal mite and the varroa mite. In addition, in 2007 a new problem called colony collapse disorder caused widespread losses of honey bee colonies. A viral pathogen appears to be at least a partial cause of this disorder. Growers of certain crops that require pollination may use other bees, including the orchard mason bee, an *Osmia* species in the family Megachilidae (the leafcutting bees).