

# Taxonomy of Insects

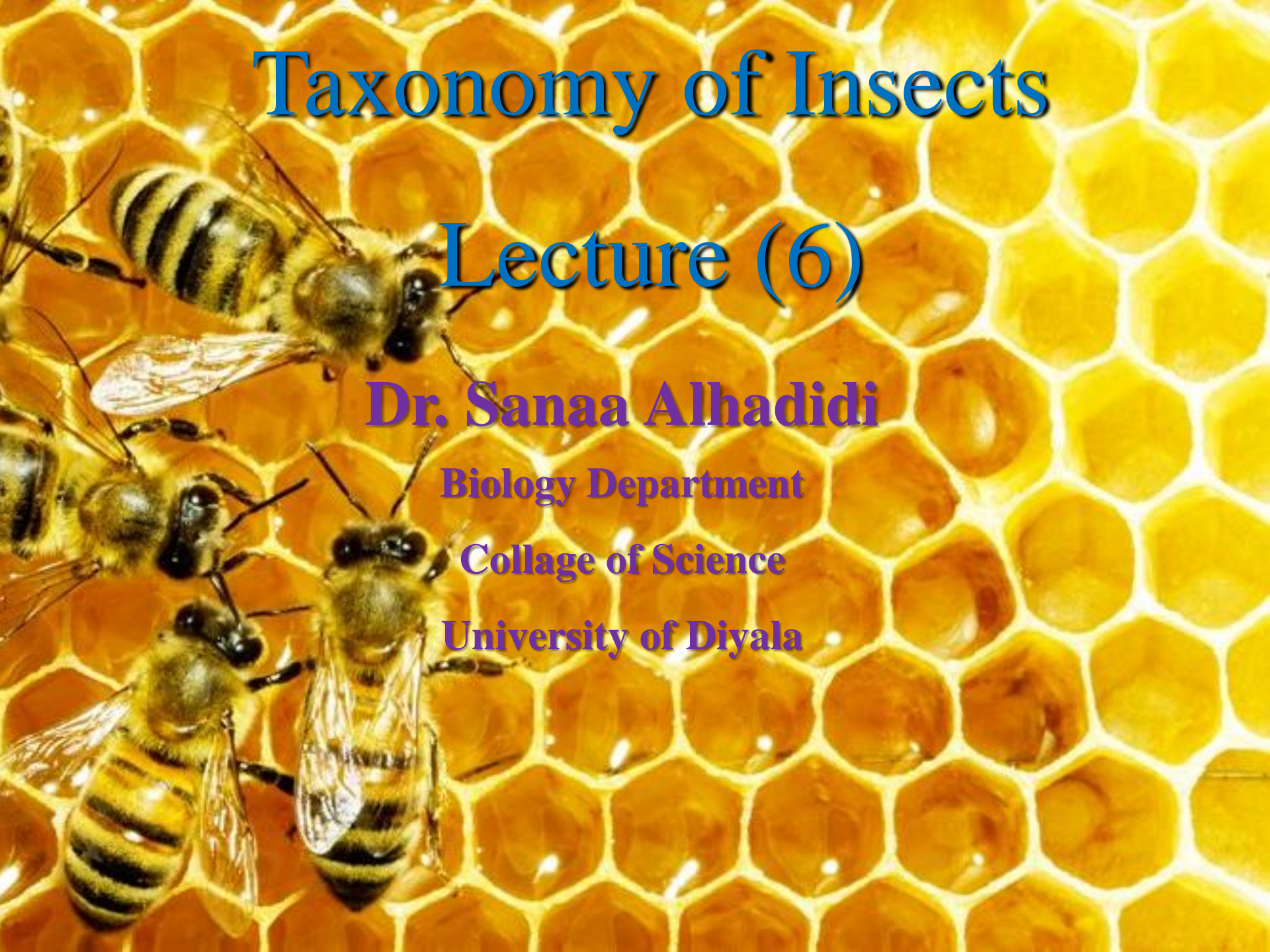
## Lecture (6)

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# Lecture Topics

- **Division: Endopterygota**
- **Order: Coleoptera**
- **Order: Hymenoptera**

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# Endopterygota (Order: Coleoptera)

## Life history and Ecology

- Coleoptera (beetles and weevils) is the largest order in the class Insecta.
- As adults, the front wings, known as elytra, are hard as the rest of the exoskeleton. They fold down over the abdomen and serve as protective covers for the large, membranous hind wings.
- At rest, both elytra meet along the middle of the back, forming a straight line that is probably the most distinctive characteristics of the order. During flight, the elytra are held out to the sides of the body where they provide a certain amount of aerodynamic stability.

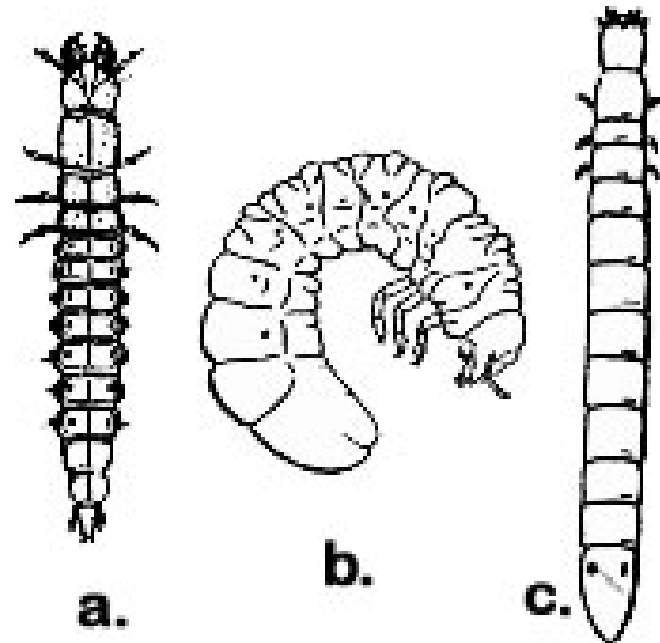
# Endopterygota (Order: Coleoptera)

- Coleoptera inhabit all terrestrial and fresh-water environments.
- They feed on a wide variety of diets, Many species are herbivores (feed on the roots, stems, leaves of their host plants).
- Many beetles are predators, attacking a wide variety of invertebrates.
- Some beetles are scavengers, feeding primarily on carrion, fecal material, decaying wood, or other dead organic matter.
- A few are parasitic beetles some are internal parasites of other insects, some invade the nests of ants or termites, and some are external parasites of mammals.
- Development: complete metamorphosis (egg, larva, pupa, adult).

# Endopterygota (Order: Coleoptera)

## Appearance of Immatures

- Head well-developed with ocelli and chewing mouthparts.
- Three pairs of thoracic legs; no abdominal prolegs.
- Body form:
  - a. Campodeiform: Slender, active crawlers.
  - b. Scarabaeiform: Grub-like, fleshy, c-shaped.
  - c. Elateriform: Wireworms; elongate, cylindrical, with a hard exoskeleton and tiny legs.

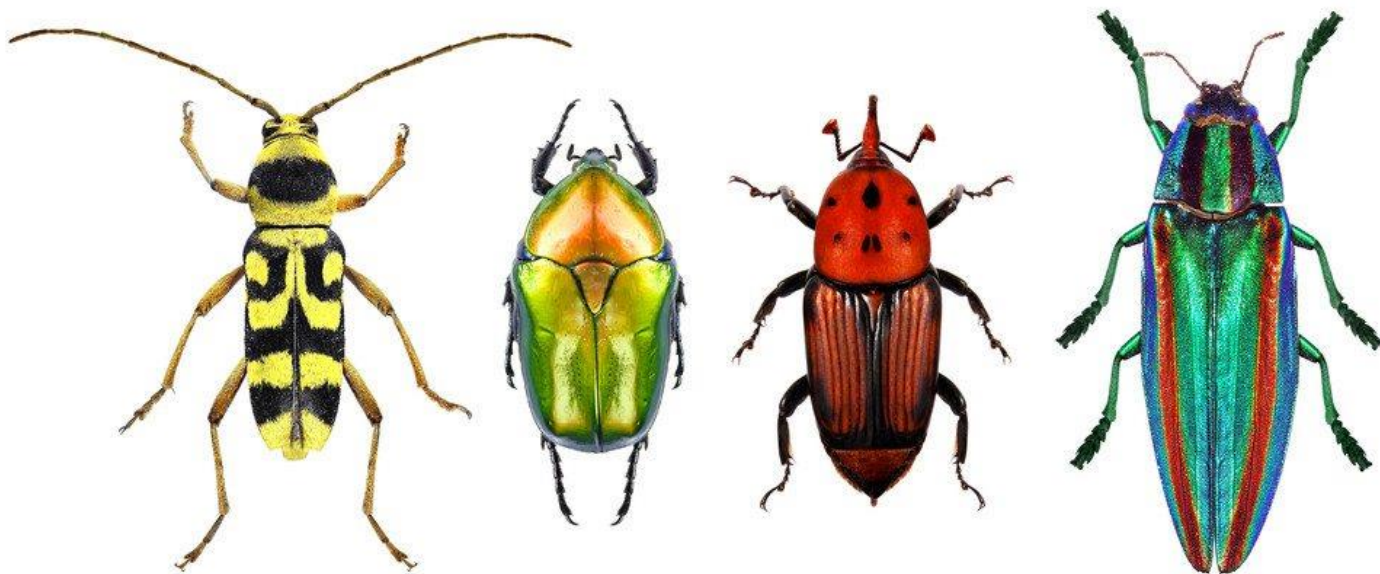




# Endopterygota (Order: Coleoptera)

## Appearance Adults

- Chewing mouthparts.
- Front wings (elytra) are hard and serve as covers for the hind wings; meet in a line down the middle of the back.
- Hind wings large, membranous, folded beneath the elytra.



# Endopterygota (Order: Coleoptera)

## Classification

### Staphylinidae (rove beetles)

- Scavengers and herbivores.
- Elytra are characteristically shorter than the abdomen.



### Curculionidae (weevils, snout beetles)

- Herbivores, pests of crops and stored grains.
- Chewing mouthparts are at the tip of a proboscis.



### Carabidae (ground beetles)

- Predators.
- Many are beneficial species.



# Endopterygota (Order: Coleoptera)

## Classification

### Elateridae (click beetles)

- Herbivores; larvae are known as wireworms.
- Some species feed destructively on the roots of crop plants.
- When adults are turned on their back, they can snap (click) the head and abdomen against the substrate to right themselves.



### Coccinellidae (lady beetles)

- Most adults and larvae are predators of aphids and scale insects.
- A few species are pests of crops.





# Endopterygota (Order: Coleoptera)

## Distribution

- Common worldwide, this is the largest order of insects.
- Approximately 166 families and 300,000 species worldwide.
- **Economic Importance**
- Many beetles are regarded as major pests of agricultural plants and stored products. They attack all parts of living plants as well as grains, and wood products.
- Scavengers and wood boring beetles are useful as decomposers.
- Predatory species, such as lady beetles, are important biological control agents of aphids and scale insects.

# Endopterygota (Order: Hymenoptera)

## Life history and Ecology

- Members of the order Hymenoptera can be regarded as ecological specialists. Most species are rather narrowly adapted to specific habitats and/or specific hosts.
- Except for worker ants, most adult Hymenoptera have two pairs of wings.
- The Hymenoptera is the only order besides the Isoptera (termites) to have evolved complex social systems with division of labor.
- Herbivory is common among the primitive Hymenoptera (suborder Symphyta), in the gall wasps (Cynipidae), and in some of the ants and bees.

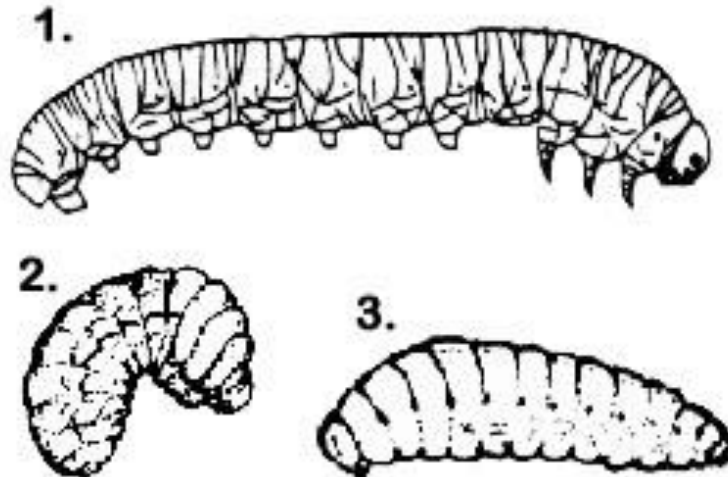
# Endopterygota (Order: Hymenoptera)

- Most other Hymenoptera are predatory or parasitic. The large hunting wasps are predators that catch and paralyze insects (or spiders) as food for their offspring. Many families of parasitoid wasps whose larvae feed internally on the living tissues of other arthropods (or their eggs). These insects eventually kill their host, but not before completing their own larval development within its body.
- Bees (superfamily Apoidea) have specialized mandibulate mouthparts where the maxillae and labium are modified into a proboscis that works like a tongue to collect nectar from flowers.
- Development: complete metamorphosis (egg, larva, pupa, adult).

# Endopterygota (Order: Hymenoptera)

## Appearance of Immatures

- 1. Sawflies:** Eruciform (caterpillar-like); well developed head capsule; chewing mouthparts; fleshy abdominal prolegs.
- 2. Bees and wasps:** Grub-like; well developed head; chewing mouthparts; legless and eyeless.
- 3. Parasitic wasps:** Body form highly reduced; lacking head, eyes or appendages.

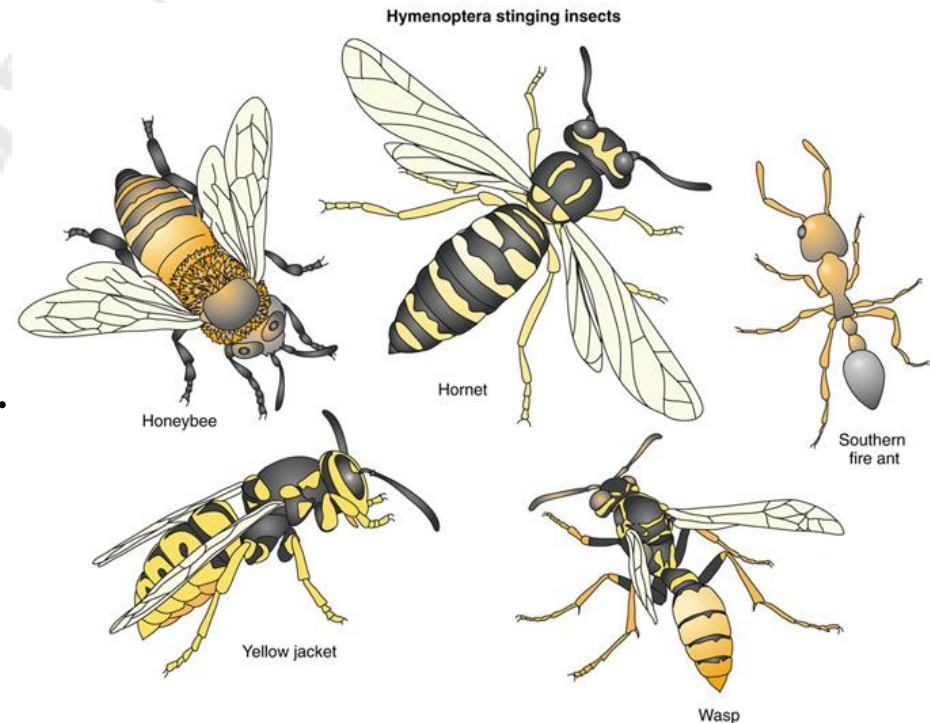




# Endopterygota (Order: Hymenoptera)

## Appearance of Adults

- Chewing mouthparts – except in bees where maxillae and labium form a proboscis for collecting nectar.
- Hind wings smaller than front wings, linked together by small hooks (hamuli).
- Compound eyes well developed.
- Tarsi usually 5-segmented.
- Triangular stigma in front wings.



# Endopterygota (Order: Hymenoptera)

**Classification** (Grouped by life history)

**Sawflies:** Larvae feed on foliage or burrow into plant tissues e.g.,

Tenthredinidae: Common sawflies.

**Horntails:** Larvae are wood borers.

**Parasitic Wasps:** Larvae are parasitoids of other insects.

Ichneumonidae — largest family of the Hymenoptera; parasitoids of other holometabolous insects (or spiders)

Encyrtidae — mostly parasitoids of aphids and scale insects.

**Predatory Wasps:** Adults provision nest sites with prey that they catch and paralyze by stinging.

# Endopterygota (Order: Hymenoptera)

**Ants:** True social insects Wingless workers (sterile females) forage for provisions (vegetation, seeds, or other insects)

Formicidae — Ants

**Solitary Bees:** Adults construct individual nests and provision them with plant materials (usually nectar or pollen).

**Social Bees:** True social insects. Communal nests are built. Workers (sterile females) forage for nectar and pollen.

Apidae — bumble bees and honey bees.

# Endopterygota (Order: Hymenoptera)

## Distribution

- Common worldwide. Third largest order of insects.
- Approximately 90 families and 150,000 species worldwide.

## Economic Importance

- Most members of the Hymenoptera are extremely beneficial either as natural enemies of insect pests (parasitic wasps) or as pollinators of flowering plants (bees and wasps).
- Some species are regarded as pests (e.g., sawflies, gall wasps, and some ants).



# Usfel websites

<https://genent.cals.ncsu.edu/insect-identification/order-coleoptera/>

<https://genent.cals.ncsu.edu/insect-identification/order-hymenoptera/>

Dr. Sanaa Alhadi

**Thanks for listening**

