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## Entomology

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### The study insects

Entomology is the study insects. There are just over 2 million identified species in the world and over a million of them belong to the class Insecta. It is believed that there are millions more to be discovered as well.

There are insects in virtually every environment on the planet. They are integral aspects of many ecosystems, providing food and acting as pollinators, scavengers, parasites, decomposers, and disease vectors.

Because they are generally small, and even the biggest (Giant Walking Stick) is only 21 inches long. The heaviest (Goliath Beetle) is 3.5 ounces. Insects can be studied easily in laboratories.

There are three basic subgroups of insects – the subclass Apterygota (wingless, primitive insects), and the subclass Pterygota (winged and secondarily wingless insects) which is further subdivided into the Exopterygota (insects with a simple metamorphosis and no pupal stage) and the Endopterygota (complete metamorphosis including pupal stage).



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## Basic Characteristics

All insects have six legs. Spiders are arachnids, not insects. The body is divided into a head, thorax and abdomen.

The head has a pair of antennae that function as both tactile and olfactory receptors. They also have mouth parts and some form of eye(s) which may be simple (ocelli), complex, or they may have both types.

The thorax is further divided into three parts (pro-, meso-, meta-) each of which have a pair of jointed legs attached to it. The abdomen has the gonopore (genital opening) and may have additional appendages.

## Apterygota

The wingless, primitive insects <sup>[1]</sup> include the springtails, bristletails, proturans and diplurans. These insects do not fly at any life stage. They are born looking like miniaturized adults and molt as they grow.

As adults they continue to molt periodically. Most species live 3-4 years and some live as long as 7-8 years. The example that most people will be familiar with is the silverfish.

## Exopterygota

These insects <sup>[2]</sup> undergo incomplete metamorphosis. The immature stage is known as a nymph. Wings develop outside of the body after a few molts.

Once they finish growing, they go through a final molt and become sexually mature adults, also known as imagos. This group includes:

- dragonflies
- mayflies
- mantids
- true bugs
- grasshoppers
- crickets
- earwigs
- stick insects
- stoneflies
- cockroaches
- thrips

## Endopterygota

These are considered the most advanced insects <sup>[3]</sup>. They have a true larval form that in no way resembles the adult. They undergo pupation before emerging in the adult form.

Larvae and adults may live in very different environments, eating totally different diets from one another.

Members of this group include:

- caddisflies
- true flies
- bees
- wasps
- ants
- butterflies and moths
- fleas
- beetles
- lacewings
- dobsonflies
- etc

## Forensic Entomology

While there are many fields of study open to the entomologist, one that has become quite popular and is relatively new is forensic entomology [4]. It makes use of insect larvae found at a crime scene to help determine time of death and other details of the crime scene.

Because many larvae undergo several instars, and the timing of each instar is well known, it is possible to use the type of instar to narrow time of death down to a very small window.

The applications of this field continue to expand beyond time of death determination and into other areas of criminal investigation.

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### Links

[1] <http://www.cals.ncsu.edu/course/ent425/text02/apterygota.html>

[2] <http://www.amentsoc.org/insects/fact-files/orders/exopterygota.html>

[3] <http://www.amentsoc.org/insects/fact-files/orders/endopterygota.html>

[4] <http://www.forensic-entomology.com/>